

BETTER BUILDINGS THROUGH ENERGY EFFICIENCY:

A Roadmap for Europe



Colophon

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CONTENTS

Summary	2
Quick Scan of Building Energy Efficiency Programmes	6
Policies for Building Market Transformation	9
Selection of Best Practices	12
Strengths and Weaknesses of Programmes	15
Prototype Instruments for Building Policies	19
Analysis of Sectors, Tenure & Regions	27
Discussion & Conclusions	34
Addendum: Summary Descriptions of Best Practices	37

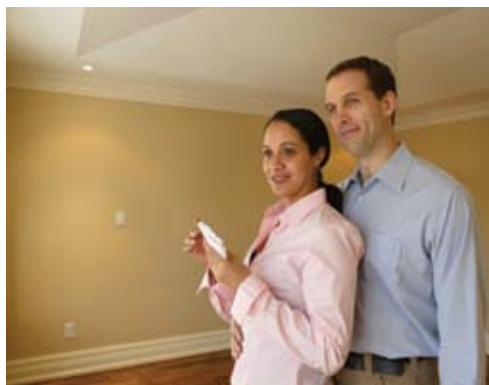


SUMMARY

This report presents the results of a quick scan of best practices in building energy efficiency policies and programmes, and recommends suitable instruments to endorse building energy efficiency in Europe. Following a review of a literature on projects & programmes, around 30 best practices were selected for further analysis. An overview of typical programmes for the various sectors of the building market was established, as well as the strengths and weaknesses of four main types of instruments. This formed the basis of the definition of prototype instruments. A last stage involved the analysis of the main barriers encountered in the different sectors and tenure situations in the building market, linking them to the prototype instruments identified. The result provides an overview of promising instruments and policy packages suggested for a successful endorsement of building energy efficiency.

Best practices are classified according to the sector they are targeting (residential, commercial and/or public, and new and/or existing buildings), for each of the four main types of instruments that are generally differentiated in policy analysis. On the whole, economic instruments (like subsidies) are most commonly applied, and the residential sector is targeted more often than commercial or public building sectors.

An analysis of the *strengths and weaknesses* of best practice programmes revealed that regulatory policy instruments can produce particular policy outcomes, if weaknesses like compliance and legitimacy are mitigated, if the behaviour of occupants does not create rebound effects, and if the dilemma of low-income households is addressed. Economic instruments providing incentives for energy-efficient improvements are needed to promote energy efficiency through market-led measures and price signals, and more targeted policy measures should be aimed at specific dilemmas like the capture of benefits in the residential sector. Communication and organisational instruments are clearly supporting tools, but nevertheless necessary to address knowledge and implementation barriers.



The analysis identified *prototype instruments*, defined as a core mode of operation of a policy or programme, applied

similarly in different settings, but always adapted to specific circumstances. Identified instruments were:

Regulatory instruments	• Regulatory benefits for above-standard energy performance • Mandatory environmental performance evaluation with minimum requirements • Above-standard requirements for government buildings • Energy upgrading requirements when renovating a building
Economic instruments	• Preferential loans for significant (above-standard) energy performance improvements • Tax credits for installing energy-saving products
Communicative instruments	• Building energy performance audits • Demonstration projects • Voluntary energy conservation agreements
Organisational instruments	• Independent energy audits with organisational support • Professional management for multi-family housing • Independent verification of sustainable real estate investments • Energy service contracts

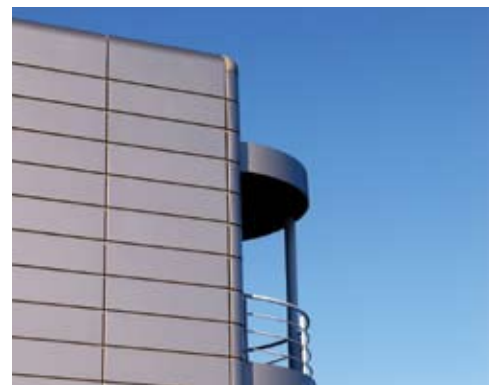
Finally, the analysis of sectors, tenure and regions resulted in a suggestion for different *policy packages* for different setting: What can work together to address a specific setting? Between sectors and tenure, there are both overlaps and differences in packages, which are explained by the similarities and differences in key barriers. Regional differences appear to be of less importance, although the

practical set-up of a policy or programme, like a preferential loan scheme or organisational support, will differ between parts of Europe. An interesting perspective for the longer term might be the combination of building regulation standards with the energy certificate levels of the Energy Performance of Buildings Directive (EPBD).



Suggested policy packages are:

	New buildings	Existing buildings
Residential buildings		
Owner-occupied	• Preferential loans for significant energy performance improvements combined with energy audits with organisational support • Mandatory performance evaluations combined with regulatory benefits for above-standard performance	• Preferential loans for significant energy performance improvements combined with energy audits with organisational support • Energy upgrading requirements combined with energy audits with organisational support
Private rental	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy audits with organisational support	• Tax credits for installing energy-saving products (for landlords) combined with energy audits with organisational support • Energy upgrading requirements combined with energy audits with organisational support
Social rental	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance	• Energy upgrading requirements combined with energy audits with organisational support
Commercial buildings		
Owner-occupied	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy conservation agreements	• Tax credits for installing energy-saving products combined with energy conservation agreements • Energy upgrading requirements
Private rental	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy conservation agreements	• Tax credits for installing energy-saving products combined with energy conservation agreements • Energy upgrading requirements
Public buildings		
Owner-occupied	• Above-standard requirements for government buildings combined with energy audits with organisational support	• Above-standard requirements for government buildings combined with energy performance contracting



The EPBD *energy certificates* requirement offers great scope for combination with other policy instruments. National and local parties implementing policies and programmes should place greater emphasis on this, as part of a European effort to capitalise on the considerable energy-saving potential in buildings. The European dimension should involve setting strategic objectives, which oblige and also support implementing parties to analyse and address barriers, and monitor the results.

The analysis and recommended policy packages presented in this report are the result of a quick scan based on a number of successful programmes, focusing

in particular on the main characteristics and key barriers identified in the building sector. Further in-depth analysis of the selected best practice programmes may provide greater insight into effective and targeted policy packages. European initiatives are needed to disseminate and discuss the results of this quick scan, to assist policy makers to understand the particular situation and specific barriers in the sector they are responsible for. This will increase the attention for good policy programmes and enhance the impact of the European building energy efficiency strategy.



QUICK SCAN OF BUILDING ENERGY EFFICIENCY PROGRAMMES

The implementation of energy efficiency improvements in buildings, whether new developments or existing commercial or residential buildings, in Western Europe or the new EU Member States, is known to be suboptimal at best. Many cost-effective and environmentally beneficial measures are *not* being implemented for a variety of reasons.

Several instruments may be applied to address the barriers to investment in building energy efficiency improvements, including (but not limited to) financial instruments, information and awareness-raising campaigns, public-private and public partnerships, institutional strengthening and capacity building. These instruments need to be investigated to identify key barriers and issues requiring intervention (by governments or other parties), and best practices in government policies, private sector initiatives and public-private partnerships used to address them.

A quick scan was initiated to look into best practices of building energy efficiency policies and programmes, to analyse the characteristics of successful cases, and to recommend suitable instruments to endorse building energy efficiency in Europe. The analysis was prepared between March and May 2006. This report presents the results of this quick scan, covering programmes and policies in the old (EU-15) and new (EU-10) Member States, as well as experiences from other countries with established or emerging building energy efficiency policies. The main focus of the project is on improvements in existing buildings (retrofitting), but remarkable initiatives aimed at above-standard new buildings are also included.

Key questions in the analysis were:

- What is known about successful building energy efficiency endorsement schemes in the EU-25 and similar countries?
- What is known about the need to stimulate building owners to implement EE measures in buildings?
- What key barriers to building-related EE measures can be targeted by projects, policies or programmes?
- Which best practices may encourage adoption of EE measures in the EU-25 and similar countries?



Step one: Review of policies & programmes

The analysis started with a review of literature on projects & programmes, scanning previously conducted studies, overview reports and policy databases. This resulted in the identification of about 10 useful best practices, a number deemed insufficient for an adequate analysis. Recognising this, the scan was extended, including experts covering different regions of Europe. This led to a significant increase in the number of cases identified, to around 30 best practices.

A best practice was only included if all of the following criteria were met:

- The programme or policy targeted building energy efficiency, separately or in combination with other objectives
- The programme or policy was aimed at influencing the mainstream of buildings (no technical pilot programmes, demonstrations, etc)
- The programme or policy was well documented with a clearly identifiable mode of operation
- The programme or policy had a good impact on the market, specifically on reducing the key barriers it was targeting

Since there are currently no quantifiable methods for measuring these aspects, the analysis relied on expert assessments to select best practices.

A fact sheet template was developed for the analysis of best practices. It includes a harmonised description of cases, specifically targeting the barriers addressed by the project, the operational mechanisms, the results and the lessons learned. An overview of the fact sheets on all best practices analysed is included in Annex A.

Step two: Analysis of best practices, barriers and instruments

Selected best practices were analysed to establish an overview of typical programmes for the various sectors of the building market: new and existing buildings, in the residential, commercial and public building sectors. A further differentiation was made based on the main typology of the instruments applied in the best practices: regulatory, economic, communicative or organisational.

The best practices were then investigated to establish the strengths and weaknesses of the four main types of instruments, when applied to the building sector. This served to identify the valuable elements of each approach, as well as the modes of operation of the various instruments applied, and prepared the ground for the next stage, the definition of the core modes of operation of best practices for the various types of instruments.



These core modes of operation can be considered a crystallisation of the best practices. Although policies and programmes may vary greatly in their specifics and the context in which they operate, there appears to be a limited number of underlying principles. For the purposes of this analysis, these were termed prototype instruments, and key modes of operation and key barriers addressed by these instruments were described.

A final stage involved the analysis of the main remaining barriers in different sectors and tenure situations in the building market. As this subject has not been widely researched, there is limited information on the barriers to the improvement of building energy efficiency. An expert workshop, conducted on 17 May 2006 in Brussels, provided an insight into key barriers and the most urgent issues to consider for the endorsement of building energy efficiency in the European Union. The findings were linked to the analysis of prototype instruments, which provided an overview of promising instruments and policy packages suggested for a successful endorsement of building energy efficiency.

Analysis considerations

The results reported here are based on a quick scan of best practices. This, by nature, implies certain limitations. A quick scan is not intended to provide full coverage of policies, programmes and projects; it must therefore be assumed that many potentially valuable cases were not included in

the analysis. This suggests that best practices with useful lessons for the endorsement of building energy efficiency may not have been considered, and that there are more successful prototype instruments than those listed here. Based on the data reviewed, however, it is believed that the results represent a significant share of typical experiences in endorsing building energy efficiency.

A similar limitation applies to the barrier analysis. Many existing policies and programmes in Europe, and also outside Europe, are loosely based on a barrier analysis, and those that are often do not report their success specifically in overcoming addressed barriers. Other, much more demanding, research methods would be required to address this issue in more detail but, given the lack of background information on many programmes, even that would not result in a complete overview. The barrier analysis conducted here has yielded many insightful observations, but it is not complete. The findings nevertheless reveal a number of useful options for the successful endorsement of building energy efficiency, and should help policy makers identify the best ways of implementing appropriate measures on their own territories.



POLICIES FOR BUILDING MARKET TRANSFORMATION

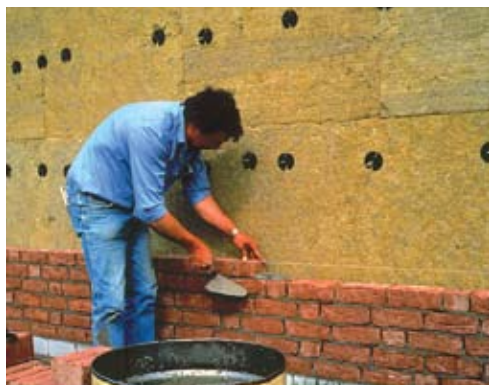
Transforming the built environment to a more sustainable situation can be a very demanding task. Experience shows that benefits from more sustainable designs often accumulated over many years, but the first cost has to be paid upfront. Many more sustainable design options can only be cost-effective if there is a large-scale market, creating a learning curve and adequate turnover to justify investment in product development.

Another complicating factor is that benefits are often social or societal, whilst costs are the responsibility of the individual constructing a building. This calls for adequate government policies, taking into account the current setting, but moving towards a more sustainable situation over time.

Market transformation strategy

The standard framework for this kind of government policy is the market transformation strategy. This strategy was developed internationally in the 1980s and 1990s, mainly to effect a change in the market for appliances (towards greater energy efficiency). Although not many countries have formally adopted a market transformation strategy for buildings, most have implemented several policies that, together, act to shift the market towards better-performing building, in line with the strategy.

Market transformation builds on a combination of requirements. The first requirement for an effective policy is to have standardised measurement procedures to determine the quality of (an aspect of) a building. A measurement procedure (also known as a test standard) can be very simple (e.g. measurement of insulation thickness), or very complicated (e.g. calculation of the total environmental impact of the building materials used).



The second requirement is to classify the performance of products, building designs or buildings, for all aspects deemed relevant to sustainable building. Experience shows that it is preferable to classify the performance of buildings according to performance levels. Performance classifications can be based on efficiency (e.g. maximum heating energy demand per square metre, minimum noise reduction of a wall), or on absolute performance (e.g. maximum indoor air pollution level). The classification should include current practices (ranging from very bad to very good), as well as an optimal level.

With these two requirements, performance levels can be determined. Ideally, three levels are introduced:

- A minimum performance level, which needs to be achieved by all buildings
- A best practice level, which describes the level reasonably achievable with good design and building practice
- A state-of-the-art level, which describes the maximum level that can be achieved in the current context

The first, the minimum performance level, is set by law and official enforcement is crucial for this level. The second, the best practice level, is often used for official government endorsement purposes (e.g. subsidies, government procurement policies) to stimulate the market, but doesn't have to be enforced by law. The third, the state-of-the-art level, is usually set by a government as a target for the future. It is used to promote and demonstrate new options, thus making these more acceptable in daily practice.

The market transformation strategy works with a combination of policies that ban the worst building designs from the market, raise awareness of sustainable building issues, and educate professionals (and sometimes the public) about options to improve buildings and demonstration projects, or design competitions to prove the viability of new designs. Ultimately, the strategy builds on the ability to constantly move to higher sustainable building quality levels (which is enabled by the strategy itself). What is best practice one year could well be the minimum performance level a few years later, and so on.

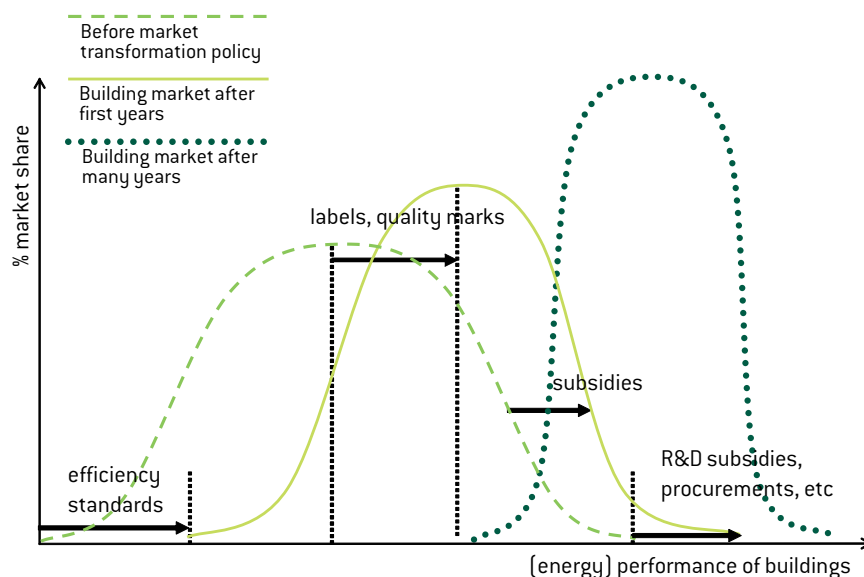
A vital element in any market transformation strategy is communication with market parties about the classification. For appliances, 7-class energy labels exist in Europe, which show the relative performance of the product in comparison to others. The energy certificates of the Energy Performance of Buildings Directive (EPBD) aim to address existing buildings in a similar manner. However, it should be borne in mind that, for building market transformation, the actual customers are often not the occupants (households) but the project developers, designers and/or constructors, and it may be more effective to target these parties.

Furthermore, architects and contractors can only apply better products, materials, technologies and design options if these are available to them. Thus, there is a strong link with product policies, promoting products that are less polluting, consume less energy during production, and are made from sustainable resources.

The graph below shows the relationship between the



performance of buildings (or building designs) and the policies applied to improve this performance. This graph is derived from the energy performance situation that is commonly observed with products (appliances, heating installations, etc).



Product policies can regulate the characteristics of a product or use subsidies to endorse specific products, but inherent product characteristics can also be influenced by industry policy (e.g. levies on scarce resources, production waste or industrial energy consumption; carbon emission reduction schemes).

On a national level, building policies relate to national sustainable development policies, but are also linked to the general economic policies of a country. They must also take into account the economic development of a country: when people get wealthier, they generally desire larger and more comfortable homes. As the environmental

impact of buildings is closely linked to their size, this trend puts additional pressure on the need to decouple economic development from environmental performance.

Building policies also relate to social policies. Adequate housing is considered to be a social right. Moreover, people have a social (or cultural) bond with their built environment, and many people do not appreciate large-scale demolition of housing blocks to make way for new developments, or the relocation of communities. These issues should be given due consideration when developing building policies.



SELECTION OF BEST PRACTICES

In the course of the quick scan, around 30 best practices were identified that represent successful cases of building energy efficiency endorsement. These are described in the fact sheets (see Annex A) listing:

- The title of the project, the country it was implemented, and a programme summary
- The sector(s) targeted, the type of policy instrument and the level at which it was implemented
- The way in which the programme operated
- The key barriers addressed by the programme
- The results achieved
- The lessons learned, in terms of both strengths and weaknesses

Not included in this analysis are regular building energy codes for new construction, which are nowadays common practice in European countries.

As a first step in the analysis, best practices are classified according to the sector they are targeting (residential, commercial and/or public, and new and/or existing buildings), for each of the four main types of instruments that are generally differentiated in policy analysis (based on the classification of the Dutch Scientific Council for Government Policy):

- Regulatory instruments, mainly based on mechanisms of force
- Economic instruments, characterised by a financial transaction
- Communicative instruments, characterised by persuasion
- Organisational instruments, that work either by force (e.g. of a procedure) or as facilitators

This information is presented in tables for new and existing buildings, and project summaries are included in the last section of this report. The numbers refer to the fact sheets that provide an extended description of the programme.



Overview: new buildings

	Residential buildings	Commercial buildings	Public buildings
Regulatory instruments	• Added density allocations for LEED-certified buildings [1] • Voluntary building code with added density allocation [2] • PIMWAG evaluation as a prerequisite for building permits [3] • Five Star Standard [4]	• Added density allocations for LEED-certified buildings [1] • Voluntary building code with added density allocation [2]	• Voluntary building code with added density allocation [2] • Increased requirements for federal buildings [5]
Economic instruments	• KfW CO₂ reduction programme and loans [7] • Energy-Rated Homes of Vermont [8] • LEED Incentive Program [9] • Energy Star rating in combination with tax credits [10] • Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12]	• LEED Incentive Program [9] • Energy Star rating in combination with tax credits [10] • Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12]	• Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12]
Communicative instruments	• Energy audits [18] • Demonstration of low-cost, low-energy residential buildings [19] • CASBEE [20]	• CASBEE [20] • Voluntary energy conservation agreements [21]	• Voluntary energy conservation agreements [21]
Organisational instruments	• Energy-Rated Homes of Vermont [7] • Sustainable real estate investment trusts [22] • MINERGIE [23]	• Sustainable real estate investment trusts [22]	• None identified



Overview: existing buildings

	Residential buildings	Commercial buildings	Public buildings
Regulatory instruments	• Energy regulations for existing stock [6]	• None identified	• Increased requirements for federal buildings [5]
Economic instruments	• KfW CO₂ reduction programme and loans [7] • Energy-Rated Homes of Vermont [8] • Residential Energy Efficiency Credit Line [13] • Landlord's Energy-Saving Allowance / Green Landlord Scheme [14] • Sustainable Communities Plan [15] • Energy Efficiency Commitment [16] • Energy Star rating in combination with tax credits [10] • Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12]	• Energy Star rating in combination with tax credits [10] • Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12] • Sustainable Communities Plan [15] • Energy Innovators Initiative [17]	• Reduced VAT for energy-saving materials and installations [11] • Regulatory Energy Tax [12]
Communicative instruments	• Energy audits [18]	• Voluntary energy conservation agreements [21]	• Voluntary energy conservation agreements [21]
Organisational instruments	• Energy-Rated Homes of Vermont [8] • Chance Energiepass Partner Programme [24] • Energy performance advice [25] • Homeowners' associations of multi-family apartment buildings [26]	• None identified	• ESCO contracts for municipal buildings [27]



STRENGTHS AND WEAKNESSES OF PROGRAMMES

Each policy and programme has its own specific benefits, as well as some weak points. In this section, the strengths and weaknesses of different policy instruments to promote energy efficiency in buildings are summarised in relation to the basic typology of regulatory, economic, communicative and organisational policy instruments.

Two programmes are presented as examples of each instrument. These demonstrate the specific strengths and weaknesses of each type of policy, as a starting point for further analysis of the main policy instrument types. Recognition of strengths and weaknesses is essential in order to identify combinations of policy instruments that support but not limit each other, and to select policy types to target specific barriers.

Regulatory instruments

Regulatory policy instruments could produce particular policy outcomes if compliance and legitimacy are ensured, if the behaviour of occupants does not create rebound effects, and if the dilemma of low-income households is addressed (regulations cannot be imposed on existing housing overnight, as most energy measures are not yet cost-effective and not all households are in a position to comply with mandatory standards). Compliance with building regulations remains a key issue in EU countries, where the energy performance of new buildings regularly fails to meet the standards set by the regulations, while authorities are reluctant to force them on private owners. Compliance (and sanctions) with respect to existing housing stock is especially problematic, as not all renovation work requires notification of the building authorities. Furthermore, regulations never address all the technical or economic potential, so incentives beyond the (often conservative) standards need to be introduced.

Germany is one of the very few countries to have introduced energy regulations on existing stock (fact sheet no 6). According to new regulations, when more than 20% of the area of a component needs to be changed, this has to be done in line with the requirements for new construction. The combination of building regulation standards with EPBD energy certificate levels is an interesting approach that warrants further research.



Compared to the residential sector, the public sector has more capital and knowledge, so there is no similar conflict between environmental and social values arising from the introduction of new legal requirements. Energy efficiency in government buildings can set a very powerful and public example of energy efficiency. In the US, new federal buildings will be required to consume 30% less energy than that allowed under the standard for commercial buildings or the International Energy Conservation Code for residential buildings (fact sheet no 5), and additional measures, such as solar energy and better measurement of energy expenditures, are encouraged. However, the requirements apply only if the changes are deemed 'life-cycle cost-effective' over a building's lifetime. There has also been concern that saving energy is not a top priority for voters, who may not like their tax dollars spent on improving government buildings.

Energy requirements may also be connected to the building permit process. In the Viikki housing area of Helsinki, all building projects must undergo an environmental impact assessment and meet the basic requirements of PIMWAG criteria in order to obtain a site and building permit (fact sheet no 3). As there is a very limited market demand for sustainable building, owners and developers are unlikely to make use of voluntary environmental assessment methods, but if they are a prerequisite for a building permit, they will be obliged to use them. The programme educates different players in the evaluation process, and a minimum requirement level forces them to consider environmental improvements in areas where they are most cost-

effective. Despite the high requirement level, contractors and developers were keen to join the project, as good construction sites are few and far between in Helsinki, but this does not apply in low-demand areas. Furthermore, this kind of programme works only if the public authority owns the land. The assessment process requires adequate capacity and expertise from the building permit authority. In this case, the PIMWAG system was tailored to Viikki, but it may be difficult to develop one method that can be applied to all projects, without it becoming too extensive for practical use.

Economic instruments

Economic instruments providing incentives for energy-efficient improvements are needed to promote energy efficiency through market-led measures and price signals. Subsidies or preferential loans could be combined with EPBD energy certificates: improvement by one or two certificate levels (A to G, as in household appliances) could be a prerequisite for a fiscal incentive.

In Germany, the Federal Investment Bank has introduced a KfW CO₂ reduction programme (fact sheet no 7) for existing buildings, offering loans at 3% points below market interest rates for initially four different packages of emission reduction measures with a minimum CO₂ reduction of 40 kg per m² per year. The drawbacks of this kind of programme are that a preferential loan could be regarded as a hidden subsidy, there is a risk of a free-rider effect (loans



are benefiting parties that would implement the measures anyway), handling applications is labour-intensive and, in order to achieve adequate savings, the reduction target needs to be high enough, yet still in proportion to the cost of improvements required to achieve it. On a positive note, a specific amount of CO₂ reduction per floor area is required by the programme.

In the rental sector, investments in energy efficiency benefit the tenant (in the form of lower energy bills), rather than the landlord (who has to make the investment). In order to overcome this barrier, the UK government introduced the Landlord's Energy Saving Allowance (LESA), to be continued as the Green Landlord Scheme, providing private landlords with upfront relief on capital expenditure for energy-efficient installations in residential properties which they let (fact sheet no 14). This programme is one of the few to address the capture of benefits, especially when the private rental sector is the most energy-inefficient form of tenure in the UK. However, a tax deduction is of little use to landlords whose expenditure already exceeds income, which can easily happen in the early years of letting a property, when interest on the loan used to secure the investment (together with other costs) may already create a tax loss. LESA incentives are targeted at specific measures, like cavity wall insulation, but a more general approach directed towards the thermal performance of a dwelling could be adopted, where an annual tax relief would reward landlords whose properties meet a certain level of energy efficiency.

Communicative instruments

Communicative instruments are needed because, unlike in new construction, renovation is often carried out by non-professionals, particularly in the owner-occupied and private rental sectors.

In Central Europe, where the knowledge barrier is especially high, the 'Demonstrating Low-cost Low-energy Residential Buildings and Sustainable Urban Development' programme focuses on concepts that are implemented in actual projects in order to persuade architects, developers and investors, through with practical examples, that efficiency in new housing is feasible at reasonable cost (fact sheet no 19). The strength of the programme is the demonstration of existing low-cost solutions; energy consumption in new buildings is reduced without increasing the costs of construction. The programme is voluntary, however, and much effort is required to change overriding attitudes and remaining financial barriers. Like most communicative instruments, the programme is clearly a supporting tool.

In Germany, the Chance EnergiePass Partner Programme (fact sheet no 24) is an example of a public-private partnership, involving the German Energy Agency and various professional parties. It consists of an energy-rating Internet tool that can be employed by professional owners for their own use and DIY stores for advice to customers. The system, which can be used to obtain an EPBD energy certificate, is characterised by several degrees of advice, with increasing involvement of experts at increasing prices.



The programme addresses practical implementation barriers and is relatively low-cost, but as a voluntary information system without any fiscal incentives, it is likely to interest only the most active parties in the market.

Organisational instruments

Organisational policy instruments can support the implementation of energy measures through facilitative or structural measures.

In Finland, positive results have been obtained from energy audits (fact sheet no 18) and voluntary energy conservation agreements (fact sheet no 21). The Finnish programme is characterised by broad participation, involving various sectors of the economy and active participation inside a given sector. There is focus on concrete energy-saving actions (objectives in other countries are generally related to environmental targets), specialised assistance with the implementation of an agreement by non-profit energy agency Motiva, and a voluntary approach to meeting objectives (there are no sanctions for non-compliance and few fiscal incentives). Companies or municipalities that have entered into an agreement undertake a start-up energy audit and compile a plan on increasing the efficiency of energy use. Parties involved in the agreement are more heavily subsidised on energy audits than companies not in the agreement. However, single-family homes, (accounting for almost 50% of space-heating energy consumption in Finland), are outside the energy audit programmes.

Promotion of housing associations and professional housing management, combined with recommendations for energy efficiency and financing mechanisms, facilitates the process of improving energy efficiency of multi-apartment residential buildings, which represent a large share of the building stock in the new Member States. Many shortcomings can be observed in the management of such buildings. In Bulgaria, the Sustainable Homeowners Associations of Multi-Family Buildings programme address the problem with organisational measures (fact sheet no 26). The establishment of housing associations has been an important step in improving facility management and energy efficiency of housing stock. A weakness of the programme is that financial barriers remain, and individual homeowners and associations do not always have the expertise to manage their buildings or plan and implement major renovations. Furthermore, more than 90% of the housing stock in Bulgaria is privately owned, which makes the establishment of housing associations difficult.



PROTOTYPE INSTRUMENTS FOR BUILDING POLICIES

The best practices described in this report were analysed to identify which prototype instruments were used. In this analysis, a prototype instrument is defined as a core mode of operation of a policy or programme, applied similarly in different contexts, but always adapted to specific circumstances.

Best practices were analysed, for each of the four types of policy (as presented in the overview of best practices) and according to the sector they were targeting (residential, commercial and/or public, and new and/or existing buildings). Based on this, prototype instruments are presented each describing a successful means of endorsing building energy efficiency improvements if the barrier addressed by the instrument is relevant to the country and segment of the market. This latter aspect will be discussed in the next section.



Regulatory instruments

Regulatory benefits for above-standard energy performance		
Description:	Via building regulations, governments can give non-financial benefits to building owners or developers, who voluntarily comply with high energy performance levels. A typical benefit is allowing a larger property to be built on a plot of land (where restrictions apply). Another potential benefit would be to give beneficial treatment (e.g. priority processing) to building permit applications, if the building meets certain energy performance levels.	
Key barriers(s) addressed:	In the current situation, in which housing demand exceeds supply, it is difficult to introduce new purchasing criteria, like energy efficiency, to the consumer side without government support. Projects incorporating energy objectives early in the design process, during the permit stage, can achieve higher performance levels at less cost than projects which consider sustainable building strategies late in the design process.	
Applies to:	• New buildings	• Residential • Commercial • Public

Mandatory environmental performance evaluation with minimum requirements		
Description:	Instead of requiring a defined energy or environmental performance level, governments can also oblige building owners to perform an integral assessment, and select some of their own performance improvements, as long as the total improvement adds up to a specified level (via a score list). This tool is better suited to new building developments but, in a simplified form, could also be applied to retrofitting or urban renewal projects.	
Key barriers(s) addressed:	As there is no market demand for sustainable building, owners are unlikely to make use of voluntary environmental assessment methods, but if such assessments are required to obtain building permits, they have to use them. Moreover, a minimum requirement level forces them to consider environmental improvements where they are most cost-effective. This is very educative for owners and inhabitants.	
Applies to:	• New buildings	• Residential • Commercial • Public



Above-standard requirements for government buildings

Description:	Mandatory standards often do not realise the full cost-effective potential of energy efficiency measures, as governments are often reluctant to push the market forward too fast. For their own buildings, this should not be a limitation, and governments could apply stricter rules to their own buildings, as long as the measures are cost-effective.	
Key barriers(s) addressed:	In most countries, governments are, in principle, committed to designing, constructing, maintaining, and operating their facilities in an energy-efficient manner, but there is still a wide gap between policy and practice. Government agency policies and activities can also have an indirect impact on the broader market for sustainable construction.	
Applies to:	• New buildings • Existing buildings	• Public

Energy upgrading requirements when renovating a building

Description:	Although existing stock represents by far the largest and most cost-effective potential for energy efficiency improvements, it is uncommon to set minimum energy efficiency standards for existing buildings, as this could have a severe impact on many building owners, who have no plans for upgrading their buildings. Rules requiring that, when a renovation is underway, other components of the building also be addressed (e.g. insulating all roofs when a major roof renovation is planned) to a large extent mitigate this risk, while ensuring that renovations are carried out in an energy-efficient way.	
Key barriers(s) addressed:	While the construction industry is expected to take the lead in improving energy efficiency, it should be borne in mind that new construction is nearly always more profitable and less risky than renovation, as many renovations are very small. The business-as-usual scenario is maintained with additional insulation or replacement of windows, but these autonomous developments are not sufficient to fully realise the potential identified in existing building stock.	
Applies to:	• Existing buildings	• Residential • Commercial • Public



Economic instruments

Preferential loans for significant (above-standard) energy performance improvements		
Description:	Above-standard energy performance levels can be more expensive to achieve, partly due to their novelty. Preferential loans address the higher investment cost of such measures, by reduced interest rates and/or better loan terms. In addition, financial benefits give a signal to the market about desired improvements.	
Key barriers(s) addressed:	Efforts to promote sustainable building through market-led measures and price signals may not be adequate to attract investments. Programmes like soft loan incentives can also emphasise energy efficiency in decision making and facilitate the implementation of measures.	
Applies to:	• New buildings • Existing buildings	• Residential • Commercial

Tax credits for installing energy-saving products		
Description:	Tax credits lower the cost of energy-efficient materials and installation products, thereby reducing the price gap between these and regular products. This reduces the added investment, and improves the payback of investments in building energy efficiency.	
Key barriers(s) addressed:	Energy efficiency is not a sufficient market factor to attract investment, especially in existing buildings, when most measures give a limited return on investment, and only short payback periods are accepted in the commercial and rental sectors. The main reason for this is that such investments benefit the tenant (in the form of lower energy bills), rather than the landlord (who has to make the investment). A cut in the rate of VAT on energy-saving materials will make it cheaper for all people to insulate their homes.	
Applies to:	• New buildings • Existing buildings	• Residential • Commercial • Public



Communicative instruments

Building energy performance audits		
Description:	Energy audits, sometimes subsidised, provide building owners with a detailed overview of the energy efficiency potential of their building and how it can be realised. As many owners lack the capacity to assess buildings themselves, this allows for an informed choice by the building owner about upgrading his property.	
Key barriers(s) addressed:	Energy audits address the knowledge barrier (with respect to individual energy consumption, and what can realistically be done to lower energy bills) by providing specific information on a project's primary energy use, energy-saving potential and the use of renewable energy sources, as well as presenting improvement suggestions and cost calculations.	
Applies to:	• New buildings • Existing buildings	• Residential • Commercial

Demonstration projects		
Description:	Demonstration projects are intended to show, in real life, that energy-efficient homes do not have to cost a fortune and are perfectly comfortable. This is especially important in countries where energy efficiency is a fairly new notion that the market is not really familiar with.	
Key barriers(s) addressed:	Demonstration projects can help overcome the commonly held belief that energy-efficient design and construction are more expensive than conventional approaches.	
Applies to:	• New buildings	• Residential • Commercial • Public



Voluntary energy conservation agreements

Description:	Energy efficiency is usually not a core aspect of a business operation, leading to a lack of attention to cost-effective improvements. Voluntary agreements to assess and address the energy performance of buildings, facilitated by governments, can put this issue on the agenda and ensure that sufficient attention is directed at building energy efficiency improvements.	
Key barriers(s) addressed:	Energy agreements seek to tap into the energy-saving potential on a voluntary, market-oriented basis, so the industry itself can identify the most cost-effective CO ₂ reduction measures.	
Applies to:	• New buildings • Existing buildings	• Residential • Commercial • Public

Organisational instruments

Independent energy audits with organisational support

Description:	Independent organisations can assess a building or building plans, identify improvement options and inform the building owner of their costs and benefits. Such assessments can be used to qualify for special mortgages. In addition, the outside organisation can take over the supervision of required contractor work to improve a building, reducing inconvenience to the building owner.	
Key barriers(s) addressed:	In the owner-occupied and private rental sector, the occupants may not have any experience of procurement or finding a contractor. Practical assistance and information about loans are necessary, especially in renovation, which is sometimes seen to provide opportunities for the construction industry. However, due to high labour costs, small scale and labour-intensive nature of renovation, it is bound to be expensive, and so actually boosts the DIY market.	
Applies to:	• New buildings • Existing buildings	• Residential buildings



Professional management for multi-family housing

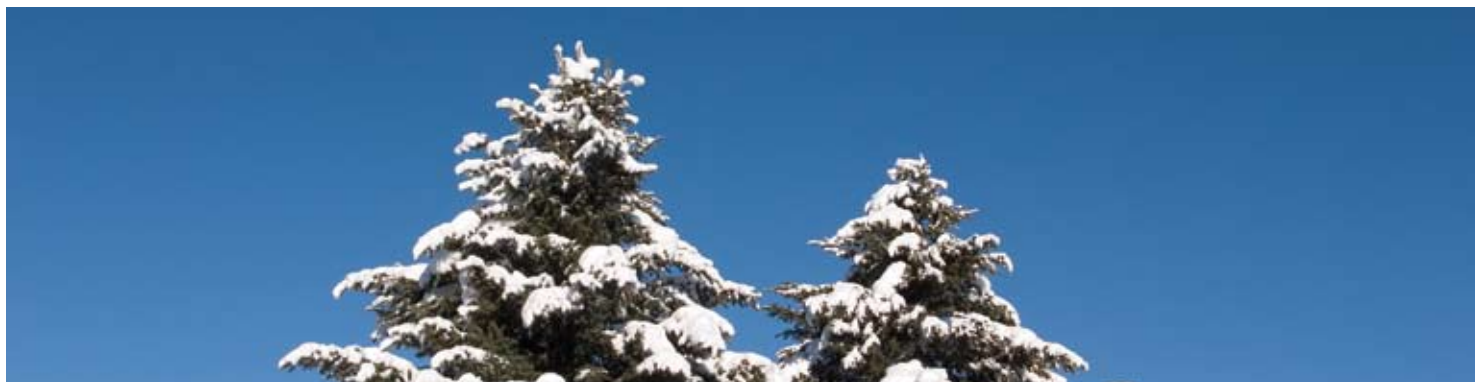
Description:	Multi-family buildings, with many different owners of flats, require cooperation between owners for energy renovation of the building. Given the lack of organisation, and the sometimes complex and costly renovation process, facilitation of this process by outside experts can improve possibilities to renovate multi-family buildings.	
Key barriers(s) addressed:	The financial management of both day-to-day activities and major renovation projects is especially poor in Central Europe, where municipal housing planning is not well developed and very fragmented. Financial resources and long-term multi-stakeholder strategies on building maintenance and renovation are often lacking or developed without the involvement of homeowners and their associations.	
Applies to:	• Existing buildings	• Residential buildings

Independent verification of sustainable real estate investments

Description:	Forward-looking investors understand the benefits of energy-efficient construction, but still have difficulty grasping the details of novel designs and techniques and calculating the cost benefits. Governments can provide independent assessments of building plans, to provide investors with a reliable appraisal of plans and calculations.	
Key barriers(s) addressed:	The novelty and technical complexity of modern energy-efficient buildings make it difficult for an investor to assess if the costs and benefits, as projected by the building developer, are realistic. The lack of a solid assessment tool implies that investors may not provide funds, even if a project would otherwise fit their criteria.	
Applies to:	• New buildings	• Commercial buildings



Energy service contracts		
Description:	Through an energy service contract, an outside party can install building energy efficiency improvements and charge for these over time, out of the energy savings achieved by the investments.	
Key barriers(s) addressed:	Public building owners often lack funds to invest in the energy performance of their building, even if the investments are cost-effective and they have a good credit rating. The same can apply to commercial building owners, thus limiting investment in building energy performance.	
Applies to:	Existing buildings	Public buildings



ANALYSIS OF SECTORS, TENURE & REGIONS

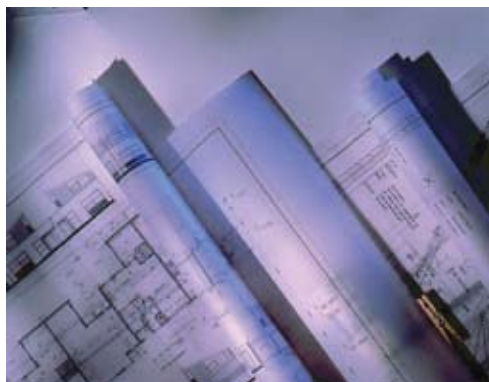
In this section, an inventory is made of the main barriers in various sectors of the building market, taking into account differences in the tenure situation of buildings. This analysis is based on the results of an expert workshop conducted on 17 May 2006. Barriers to investment in building energy efficiency improvements have not been widely researched, and a good overview of the key barriers in the various sectors is still lacking.

By analysing the results of the expert workshop, as well as the [scarce] data available, an overview was obtained of some of the key barriers. These were linked to promising instruments identified to tackle these barriers, and thereby endorse investments in building energy efficiency, using the prototype instruments presented in the previous section. Because of the expected differences in barriers in the various tenure situations, the analysis, presented in the following tables, differentiates between sectors and tenure situations. A brief description of regional differences, presumed to be of lesser importance, is also subsequently given. The numbers refer to the fact sheets [see Annex A], which provide more information on this type of programme in practice.



Barriers and instruments for new buildings

	Key barrier(s)	Promising instrument(s)	Suggested policy packages
Residential buildings			
Owner-occupied	• Lack of professional advice / limited offers • Lack of specific knowledge / knowledge of alternatives • Lack of upfront money	• Preferential loans [7] and • Regulatory benefits for above-standard energy performance, e.g. added density allowance [2] • Demonstration projects [19] and • Organisational support [8, 23] or alternatively • Mandatory environmental performance evaluation with minimum requirement [3, 20]	• Preferential loans for significant energy performance improvements combined with energy audits with organisational support • Mandatory performance evaluations combined with regulatory benefits for above-standard performance
Private rental	• Lack of upfront money • Lack of specific knowledge / knowledge of alternatives • Lack of market demand • Capture of benefits	• Regulatory benefits for above-standard energy performance, e.g. added density allowance [2] and • Tax credits for installing energy-saving products [11] • Organisational support [8, 23] or alternatively • Mandatory environmental performance evaluation with minimum requirements [3, 20]	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy audits with organisational support
Social rental	• Capture of benefits • Implications for low-income households	• Regulatory benefits for above-standard energy performance, e.g. added density allowance [2] and	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance



	Key barrier(s)	Promising instrument(s)	Suggested policy packages
Social rental		• Tax credits for installing energy-saving products [11] or alternatively • Mandatory environmental performance evaluation with minimum requirement [3, 20]	
Commercial buildings			
Owner-occupied	• Lack of professional advice / limited offers • Lack of specific knowledge / knowledge of alternatives • Requirement of very short payback times	• Regulatory benefits for above-standard energy performance, e.g. added density allowance [2] and • Voluntary energy conservation agreements [21] • Tax credits for installing energy-saving products [11] or alternatively • Mandatory environmental performance evaluation with minimum requirement [3, 20]	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy conservation agreements
Private rental	• Investments can lead to uncompetitive rents • Requirement of very short payback times • Capture of benefits • Lack of market demand • Lack of obligations	• Regulatory benefits for above-standard energy performance, e.g. added density allowance [2] and • Voluntary energy conservation agreements [21] • Tax credits for installing energy-saving products [11]	• Mandatory performance evaluations combined with regulatory benefits for above-standard performance • Tax credits for installing energy-saving products combined with energy conservation agreements



	Key barrier(s)	Promising instrument(s)	Suggested policy packages
		- In some cases independent building energy performance assessments for investors [22] or alternatively - Mandatory environmental performance evaluation with minimum requirement [3, 20]	
Public buildings			
Owner-occupied	- Lack of public acceptance - Lack of specific knowledge / knowledge of alternatives - Lack of obligations	Above-standard requirements for government buildings [5]	Above-standard requirements for government buildings combined with energy audits with organisational support

Barriers and instruments for existing buildings

	Key barrier(s)	Promising instrument(s)	Suggested policy packages
Residential buildings			
Owner-occupied	- Lack of upfront money - Lack of professional advice and support / limited offers / complicated procedure - Lack of specific knowledge / knowledge of alternatives - Lack of obligations - Lack of organisation of homeowners/complex decision making process	- Preferential loans (perhaps in combination with the EPBD energy certificates) [7] and - Tax credits for installing energy-saving products [10, 11] - Utility obligations [16] - Energy performance advice [25] - Organisational support like Chance Energiepass Partner concept [24] - Homeowner associations [26] - Demonstration projects [19] and perhaps - Energy regulations for the existing stock [6]	- Preferential loans for significant energy performance improvements combined with energy audits with organisational support - Energy upgrading requirements combined with energy audits with organisational support - Tax rebates and VAT reduction are not seen as being beneficial



	Key barrier(s)	Promising instrument(s)	Suggested policy packages
Private rental	• Lack of market demand • Capture of benefits • Lack of obligations • Lack of upfront money • Lack of specific knowledge / knowledge of alternatives	• Preferential loans (perhaps in combination with the EPBD energy certificates) [7] and • Tax credits for installing energy-saving products [10, 11] • Utility obligations [16] • Tax credits as in Green Landlord Scheme [14], • Organisational support like Chance Energiepass Partner Concept [24] • Demonstration projects [19] and perhaps • Energy regulations for the existing stock [6]	• Energy upgrading requirements combined with energy audits with organisational support • Tax credits for installing energy-saving products (for landlords) combined with energy audits with organisational support
Social rental	• Lack of obligations • Capture of benefits • Implications for low-income households	• Energy regulations for the existing stock [6] and • Energy Audits [18, 25] • Reduced VAT for energy-saving materials and installations [11] • Utility obligations [16]	• Energy upgrading requirements combined with energy audits with organisational support • Obligations for the public authorities to set example in terms of finance schemes



	Key barrier(s)	Promising instrument(s)	Suggested policy packages
Commercial buildings			
Owner-occupied	• Lack of professional advice / limited offers • Requirement of very short payback times • Lack of obligations and focus	• Energy regulations for the existing stock [6] and • Tax credits for installing energy-saving products [11] • Preferential loans [17] • Voluntary energy conservation agreements [21] • Demonstration projects [19]	• Energy upgrading requirements • Tax credits for installing energy-saving products combined with energy conservation agreements
Private rental	• Lack of professional advice / limited offers • Requirement of very short payback times • Lack of market demand/Fear of uncompetitive rents • Capture of benefits • Lack of obligations	• Energy regulations for the existing stock [6] and • Tax credits for installing energy-saving products [11] • Voluntary agreements [21] • Demonstration projects [19]	• Energy upgrading requirements • Tax credits for installing energy-saving products combined with energy conservation agreements
Public buildings			
Owner-occupied	• Lack of public acceptance • Lack of specific knowledge / knowledge of alternatives • Lack of obligations	• Above-standard requirements for government buildings [5] and Energy Service contracts [27]	• Above-standard requirements for government buildings combined with energy performance contracting



Regional differences in barriers and instruments

Differences between various regions in Europe in key barriers and potential instruments to endorse building energy efficiency appear to be smaller than differences between sectors and tenure situations in the building market. There are, however, some differences between parts of Europe that need to be considered.

For this quick scan, differences between the northwestern part of Europe, with its long tradition in energy efficiency, the southern part of Europe, with a somewhat shorter tradition, and the new Member States, with their specific background were taken into account. This does not do justice to the many differences between countries, and even within countries, that need to be addressed when designing a programme, but it does provide an overview of some core aspects.

The financing of building energy efficiency improvements is a key barrier in all of Europe, but this barrier has some different characteristics in different regions. In northwestern Europe, the issue is much more the lack of available cash and financial arrangements for the investment, than the cost of the investment itself. In Central Europe, the lack of financing is much more serious, involving amounts that may seem low by Western European standards, but could represent more than a year's average salary. Although both warrant attention with respect to the financial mechanisms, the type and scope of the mechanism needs to be adapted to the regional context.

Awareness of energy efficiency appears to be greater in northwestern Europe than in southern and central regions. In northwestern Europe, there is a general awareness of building energy efficiency issues, but the problem, especially in the owner-occupied and private rental residential sectors, is that the procedure is considered to be complicated. This is also prominent in other regions, but there also general awareness about the need to save energy must be raised.

A last issue is the difference in the tenure situation of residential buildings in particular. The situation varies from country to country, but one very relevant difference is in the typical ownership of flats in high-rise buildings. In northwestern and southern regions of Europe, these tend to be largely owned by social housing organisations and professional landlords. In Central Europe, most flats are owner-occupied, requiring more attention for organisational aspects.



DISCUSSION & CONCLUSIONS

The first step of the analysis involved a review of existing policies and programmes. In order to be selected, best practices had to be aimed at influencing the mainstream of buildings, and be well documented with a clearly identifiable mode of operation; having been shown to have a good impact on the market and on reducing targeted barriers. In general, there seems to be insufficient attention for analysing and addressing key barriers in programmes. There is also very little reliable information about the impact of policies, and very few include a monitoring programme. Another observation is that organisational support warrants more attention in policies and programmes. Few policies include organisational support programmes, but when they are applied, it is often to good effect.

Next, the strengths and weaknesses of best practice programmes were described. The analysis concluded that regulatory policy instruments may produce particular policy outcomes if weaknesses like compliance and legitimacy are mitigated, if the behaviour of occupants does not create rebound effects, and if the dilemma of low-income households is addressed. Economic instruments providing incentives for energy-efficient improvements are needed to promote energy efficiency through market-led measures and price signals, and more targeted policy measures should be aimed at specific dilemmas, like the capture of benefits in the residential sector. Communication and organisational instruments are clearly supporting tools, but necessary to address knowledge and implementation barriers. An interesting approach, not listed in the previous sections but very relevant nevertheless, is the work of the Danish Electricity-Saving Trust (see fact sheet no 28). This trust promotes electricity savings with a combination of various instruments from a single budget, which is an approach that could also be applied to building energy efficiency.



Prototype instruments and policy packages

As a further step in the analysis, prototype instruments (core mode of operation of a programme, applied similarly in different contexts, but always adapted to circumstances) were presented according to the typology of policy instruments and the application area. This part of the analysis prepared the ground for the next phase of the study, describing successful means of endorsing building energy efficiency improvements, if the barrier addressed by a given prototype instrument was relevant in a particular country or segment of the market.

The analysis was concluded with an inventory of the main barriers in various sectors of the building market (taking into account building types and tenure) and recommendations for promising policy instruments, based on the analysis of prototypes, strengths and weaknesses of best practices and the results of an expert workshop.

As each prototype instrument has its own strengths and weaknesses, and the programme needs to address more than one barrier at the same time (for example, simultaneously addressing the lack of upfront money, knowledge and obligations), a combination of instruments is required in each setting. There are also considerable differences inside a sector or tenure that call for the use of combined instruments or even differentiated policies; for instance, for policies based on energy prices, there are two main problem groups: high income households or building owners who do not have to react to price signals, and low income households who cannot afford to respond to them. Regulations can be imposed on the former, while the latter need financial incentives. Commercial

owners and landlords are very reactive to market signals and public building owners can be made to meet more stringent requirements than the private sector.

The analysis of sectors, tenure and regions resulted in a suggestion for different policy packages for different settings: What can work together to address a specific setting? The results indicate that one or two coherent packages can be formulated for each sector and tenure. The packages are a combination of two or three prototype instruments, which address the key barriers in that particular sector and tenure situation and are based on best practices. Between sectors and tenure, there are both overlaps and differences in packages, which are explained by the similarities and differences in key barriers. Regional differences appear to be of less importance, although the practical set-up of a policy or programme, like a preferential loan scheme or organisational support, will differ between parts of Europe.

European dimension of building energy efficiency

The European Energy Performance of Buildings Directive (EPBD) is a key policy instrument to further energy efficiency in buildings. The EPBD energy certificates requirement offers great scope for combination with other policy instruments. The requirement alone may have a limited impact on building energy efficiency improvements, as it targets only (a part of) the knowledge barrier, but it can be combined with instruments that target other barriers, to create a strong policy package. For example, preferential loans could be combined with EPBD energy certificates, and improvement by one or two certificate



levels (similar to the A to G classes for household appliances) could constitute a prerequisite for a fiscal incentive.

Despite initiatives like the EPBD, broad variation among, and sometimes within, Member States complicates the implementation of a uniform policy for energy efficiency in housing stock. Uniform requirements for EU building stock are unable to address variations in energy-saving potential, while uniform policies cannot fully respond to differences in purchasing power, structural and organisational matters or the perceptions of building owners. Most programmes require national or local implementation, to address the local context and create proximity to the target group. Indeed, many successful programmes are characterised by a local presence, and work closely with the building owners, who are the subjects of the approach. However, if responsibility is delegated to local governments, they must be guaranteed sufficient resources, funding and multi-disciplinary knowledge to accomplish the tasks entrusted to them.

It has been observed that many policies and programmes lack sufficient foundation in a barrier analysis, and have no clear focus on the instruments needed to support building owners in their efforts to improve the energy efficiency of their properties. National and local parties implementing policies and programmes should place greater emphasis on this, as part of a European effort to capitalise on the considerable energy-saving potential in buildings. The European dimension in this area should involve setting strategic objectives, which oblige and support implementing parties to analyse and address barriers, and monitor the results. The EU also has a considerable

role to play in transferring knowledge (e.g. with regard to European best practices).

An interesting perspective, for the longer term, that merits further investigation might be combining building regulation standards with EPBD energy certificate levels. The adoption of this approach would imply that a dwelling could not be sold or let unless its thermal performance were upgraded to an acceptable minimum level for each type of building and tenure. In the rental sector, property owners could be obliged to meet minimum energy performance standards. Such a requirement could be introduced in the course of a market transformation strategy, designed to gradually improve the energy efficiency of building stock. Economic incentives will probably be needed, however, to ensure that low-income households can meet the demands, and that the right to adequate housing is not jeopardised.

The analysis and recommended policy packages presented in this report are the result of a quick scan based on a number of successful programmes, focusing in particular on the main characteristics and key barriers identified in the building sector. Further in-depth analysis of the selected best practice programmes may provide greater insight into effective and targeted policy packages. European efforts are needed to disseminate and discuss the results of this quick scan, and to assist policy makers in describing and understanding the particular situation and specific barriers in the sector they are responsible for. This will increase the level of attention to good policy programmes and enhance the impact of the European building energy efficiency strategy.



ADDENDUM: SUMMARY DESCRIPTIONS OF BEST PRACTICES

1. United States: Added density allocations for LEED-certified buildings (Arlington County, Virginia)

Arlington County has adopted the US Green Building Council's LEED (Leadership in Energy and Environmental Design) Green Building Rating System as a method to measure the energy and environmental performance of buildings in the county. Adopted in 1999, the Arlington Green Building Incentive Program was revised and enhanced in 2003. The programme allows private developers to apply for additional density if the project achieves a LEED award (certified, silver, gold, platinum).

2. Lebanon: Voluntary building code, with added density allowance

In 2005, Lebanon adopted a thermal code for buildings, requiring new constructions to comply with minimum insulation standards. This concept was new to Lebanon, and awareness of building energy efficiency very low, even among professional parties. Since Lebanon lacked a good compliance checking regime with this new policy, it was decided to implement the thermal code on a voluntary basis for a transitional period. To stimulate voluntary adoption, the government allowed for larger floor area in buildings complying with the standard.

3. Finland: PIMWAG evaluation as a prerequisite for a building permit

The city of Helsinki requires construction processes in Viikki to follow principles of sustainable development. PIMWAG assessment criteria were chosen by the city of Helsinki through competitive bidding. The scheme was developed essentially for Viikki but is planned to be extended to other public building projects across Finland. In Viikki, all projects must meet the basic requirement level of assessment criteria in order to be granted a site and building permit.

4. Australia: Five star standard

Despite new building regulations and growing awareness of the contribution that buildings make to greenhouse emissions, there has been little improvement in the energy performance of housing in the state of Victoria, partly due to increasing new house sizes, coupled with growth in the use of central heating and air conditioning. As a key element of Victoria's 'Greenhouse Strategy', the state government has developed a sustainability standard for residential buildings, which requires a five star energy efficiency rating for new homes constructed in Victoria after 1 July 2004.



5. Unites States: Increased requirements for federal buildings (all states)

The Energy Policy Act of 1992 mandates a 35% drop in energy use by 2010 for all federal buildings. Section 109 of the new law requires that 'sustainable design principles are applied to the site planning, design, and construction of all new and replacement [federal] buildings'. In addition to the requirement for sustainable design, Section 109 requires that new federal buildings consume 30% less energy than that allowed under the standard for commercial buildings or the International Energy Conservation Code for residential building.

6. Germany: Energy regulations for the existing stock

According the new German building regulations, when more than 20% of the area of a component needs to be changed, it has to be done in line with requirements for new construction. For example, owners of existing buildings are required to replace windows in line with the regulations on new construction if more than 20% of the window area needs to be changed.

7. Germany: KfW CO₂ reduction programme and loans

The National Climate Protection Programme (NCPP) of 2000 identified renovation of existing buildings as a priority task. By implementing the climate protection programme for existing buildings, providing grants at reduced interest rate, investments of €1 billion per year were envisaged. For this purpose, €200 million per year in subsidies was earmarked by the government to reduce interest. Under this climate protection programme for existing buildings, the Federal Investment Bank (Kreditanstalt für Wiederaufbau - KfW) offered loans at 3% below market interest rates for measures undertaken to reduce emissions, with a minimum CO₂ reduction of 40kg per m² per year.

8. United States: Energy-Rated Homes of Vermont (State of Vermont)

In Vermont and several other US states, a uniform, national Energy Star rating system, known as the Home Energy Rating System (HERS), has been adopted. The Energy-Rated Homes of Vermont (ERH-VT) programme provides a one-stop service to obtain energy improvement mortgages (EIM). In order to qualify for an EIM, an energy rating must be performed. ERH-VT provides the energy assessment, obtains contractor bids for the planned measures, oversees the contractor's work, conducts a post-construction energy rating and prepares documents to secure the energy efficiency mortgage.

9. United States: LEED Incentive Program (City of Seattle)

Funded by Seattle City Light and Seattle Public Utilities, the LEED Incentive Program provides financial assistance to building owners and developers, who incorporate cost-effective sustainable building measures early in the building process. Incentives are individually negotiated. The minimum is €12,100 for projects that commit to achieving a LEED-certified rating and €16,100 for those committing to a LEED silver rating.



10. United States: Energy Star rating in combination with tax credits

The Energy Policy Act of 2005 (also see fact sheet no 8) includes tax credits for energy-efficient buildings and products. The US Environmental Protection Agency (EPA) has introduced a voluntary labelling programme, Energy Star, aiming to identify and promote energy-efficient products to reduce CO₂ emissions. The programme includes measures for home improvements, with tax credits available for a number of products reaching optimal efficiency levels, which typically cost much more than standard products.

11. United Kingdom: Reduced value added tax (VAT) for energy-saving products

A lot of effort has gone into improving energy efficiency in UK housing. To encourage investment in domestic energy efficiency, the UK government has introduced reduced VAT rates for energy-saving materials and micro-renewable energy: micro-CHP and air source heat pump systems. VAT has been cut from 17.5 % to 5 %. Five per cent is the lowest VAT rate allowed under EU agreements.

12. The Netherlands: Regulatory Energy Tax (REB)

Regulatory Energy Tax (REB) was introduced in 1996 when it became clear that a European-wide CO₂ tax would not materialise. This was the first tax introduced, not primarily for funding collective expenses, but for environmental reasons. As the tax was not intended to supplement overall government income, revenues were integrally recycled by lowering other taxes. Furthermore, from 2000 to 2004, so-called energy premiums on the purchase of energy-efficient appliances and other energy-saving measures by households were made available.

13. Bulgaria: Residential Energy Efficiency Credit Line (REECL)

The European Bank for Reconstruction and Development and the Energy Efficiency Agency of the Republic of Bulgaria have developed a crediting mechanism to the sum of €50 million to finance energy efficiency in the residential sector – the Residential Energy Efficiency Credit Line (REECL). The range of EE measures includes energy efficient windows, insulation of walls, floors and roofs, efficient biomass-fired stoves and boilers, solar water heaters, efficient gas-fired boilers, and heat pump systems for heating and cooling.

14. United Kingdom: Landlord's Energy-Saving Allowance (LESA) / Green Landlord Scheme

In 2004, the UK government introduced the Landlord's Energy-Saving Allowance (LESA). The scheme provides private landlords who pay income tax with upfront relief of up to €2,150 on capital expenditure for installations of loft insulation, cavity wall insulation and now solid wall insulation in residential properties which they let. The 2005 budget stated that, in the context of its Green Landlord Scheme, the government would explore how other tax deductions and reliefs could be developed to reward landlords who improve the energy efficiency of their properties.



15. United Kingdom: Sustainable Communities Plan

The UK government launched its Sustainable Communities Plan (Sustainable Communities: Building for the Future) in 2003. The plan sets out a long-term programme of action to develop sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in the South East, low demand in other parts of the country, and the quality of public spaces. The plan includes not only a significant increase in resources and major reforms of housing and planning, but a new approach to how we build and what we build.

16. United Kingdom: Energy Efficiency Commitment

Under the Energy Efficiency Commitment (EEC), electricity and gas suppliers are required to achieve targets for the promotion of improvements in domestic energy efficiency. These suppliers provide subsidies to promote the installation of energy-saving measures by residential customers, and are rewarded with defined energy-saving benefits for each measure subsidised.

17. Canada: Energy Innovators Initiative (EII)

The Energy Innovators Initiative (EII) helps commercial and institutional organisations overcome barriers to pursuing improved energy efficiency through renovation, equipment upgrades and other energy-saving measures. The EII offers its members financial incentives of up to 50% of the cost of planning a renovation, such as energy management plans, audits and feasibility studies. Funding (up to 25% of costs) is also available for implementation of energy retrofit projects (based on actual energy savings).

18. Finland: Energy Audits

Even if the energy performance of housing is relatively good in Finland compared to European average, according to energy audits of buildings and processes backed by the Ministry of Trade and Industry, Finnish buildings still have remaining energy-saving potential of up to 20.5% in heating, 7.6% in electricity and 13% in water consumption. Energy audits assess project-specific primary energy use, energy-saving potential and use of renewable energy sources, and offer improvement suggestions (with their CO₂ reduction impact) and cost calculations.

19. Czech Republic: Demonstrating Low-cost, Low-energy Residential Buildings and Sustainable Urban Development

High energy consumption in residential buildings incurs unnecessary energy costs and results in damage to the environment. This project supports the idea of avoiding such wasteful expenditures by designing and developing better housing in a cost-effective manner. Concepts are implemented through actual projects to persuade architects, developers and investors, through practical examples, that the concept of energy efficiency in new housing developments is attainable at a reasonable cost.



20. Finland: Voluntary energy conservation agreements

In the context of its National Climate Strategy and associated Energy Conservation Programme, voluntary energy conservation agreements play a central role in the implementation of energy efficiency in Finland. Energy conservation agreements are framework agreements between the Ministry of Trade and Industry (KTM) and various sector organisations. The voluntary energy conservation agreement programme was launched in Finland in November 1997, not just for industry concerns, but also for building, energy, transport and public sectors.

21. Netherlands, UK: Sustainable real estate investment trusts

These trusts, a form of investment funds, aim to link building sustainability to added value, economic returns and reduced investment risks. These are private sector initiatives, supported by government funds to facilitate the development of methodologies.

22. Switzerland: MINERGIE

MINERGIE is a quality label for new and refurbished buildings. Comfort is the central theme – the comfort of the users living or working in the building. This level of comfort is achieved by high-grade building envelopes and the systematic renewal of air. Specific energy consumption is used as the main indicator to quantify the required building quality.

23. Japan: CASBEE assessment tool

A CASBEE assessment provides a rating of the environmental quality of a building (indoor environment, quality of service, outdoor environment on site) versus the environmental load (energy, resources, materials, off-site environment). The programme operates by providing all involved parties with a common language and target, to facilitate communication among stakeholders. A CASBEE assessment is now a mandatory requirement for a building permit in five municipalities, some of these also requiring a minimum performance level.

24. Germany: Chance Energiepass Partner Programme

A German public-private partnership, involving the German Energy Agency and various professional parties, initiated the Chance Energiepass (Opportunity Energy Certificate) Partner Programme. It consists of an Internet tool that can be used by professional home owners (housing corporations, professional managers) for their own use, and DIY stores for advice to customers. The tool provides energy ratings of homes, and advice on how to improve energy performance. The system is characterised by several degrees of advice, from basic to more advanced, with increasing involvement of experts at increasing prices.



25. The Netherlands: Energy Performance Advice

To stimulate investments by home owners in the energy performance of existing houses, the Dutch government initiated a programme of subsidised energy performance advice. This was coupled with a subsidy programme for energy measures, and subsidies were higher if the investments had been recommended in an energy performance advice. Almost three-quarters of home owners indicated that the advice had not changed their planned investments in the energy performance of their homes. This subsidised advice has proved particularly popular with housing corporations.

26. Bulgaria: Sustainable Homeowner's Associations of Multi-family Apartment Buildings

While multi-apartment residential buildings represent a large share of the total building stock in Bulgaria, many shortcomings can be observed in the management of such buildings, which impedes the implementation of energy efficiency measures. The promotion of housing associations to improve sustainable housing management of multi-family buildings, combined with recommendations for energy efficiency measures and appropriate financing mechanisms, facilitates the process of improving energy efficiency in existing apartment buildings.

27. Czech Republic: ESCO Contracts for Municipal Buildings

The municipality of Jablonec nad Nisou conducted a review of the energy bills of municipally owned buildings and identified buildings with higher than average energy consumption. They proposed a series of improvements to a group of municipal buildings – three elementary schools, eight infant schools, a former infant school now divided into a multi-use unit (private school, children's day centre and health centre), and a swimming pool. Energy efficiency measures were adopted in all the buildings, except five schools, where only energy management measures were proposed and implemented by the ESCO.

28. Denmark: Electricity Saving Trust

The Danish Electricity Saving Trust (Elsparefonden) has developed a push/pull mechanism to promote the adoption of energy-efficient products. The trust urges manufacturers and retailers to put more efficient products on the market by providing information about upcoming programme activities, creates consumer awareness of new products and provides subsidies for qualifying products. The trust's mechanisms are tailored towards end-use products.

29. Spain: New building regulations, including minimum requirements for solar energy use

New Spanish building regulations require, amongst other things, that all new domestic buildings cover 30 - 70 per cent of hot water needs using solar thermal energy, depending on location and quantity of hot water used. The obligation also applies to buildings undergoing substantial renovation. In addition, new building codes will oblige all commercial buildings over 4000 m² to be equipped with photovoltaic panels to generate electricity.

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