

# Cost-Effective Energy savings in the European Building Stock

A dark blue silhouette of a person climbing a large rock formation, set against a lighter blue background with a mountain range.

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# The challenge

- Kyoto:
  - 8% CO<sub>2</sub> emission reduction in 2012 (EU)
- EU Action plan for energy efficiency:
  - 20% in 2020
- IPCC:
  - 60-80% CO<sub>2</sub> in 2050
- Large energy savings potential in the Built Environment



## Examples: New residential area

- 337 houses, school
- High quality building envelope
  - Insulation R=3-5
  - High performance glazing
  - Air leakage suppression
- Energy system
  - Heat pump
  - Collective source (aquifer)
  - Heat recovery
- Additional
  - Free cooling
  - Healthy and comfortable inner climate



# Refurbishment head office WWF

- Old laboratory (1954)
- Building facade
  - Triple glazing
  - High level insulation
  - Shading system
- Energy system
  - Bio-oil cogeneration
  - Solar cells



# Regular building stock



# The EU EPB-Directive

- Entry into force: 04.01.2003
- latest implementation: 04.01.2006



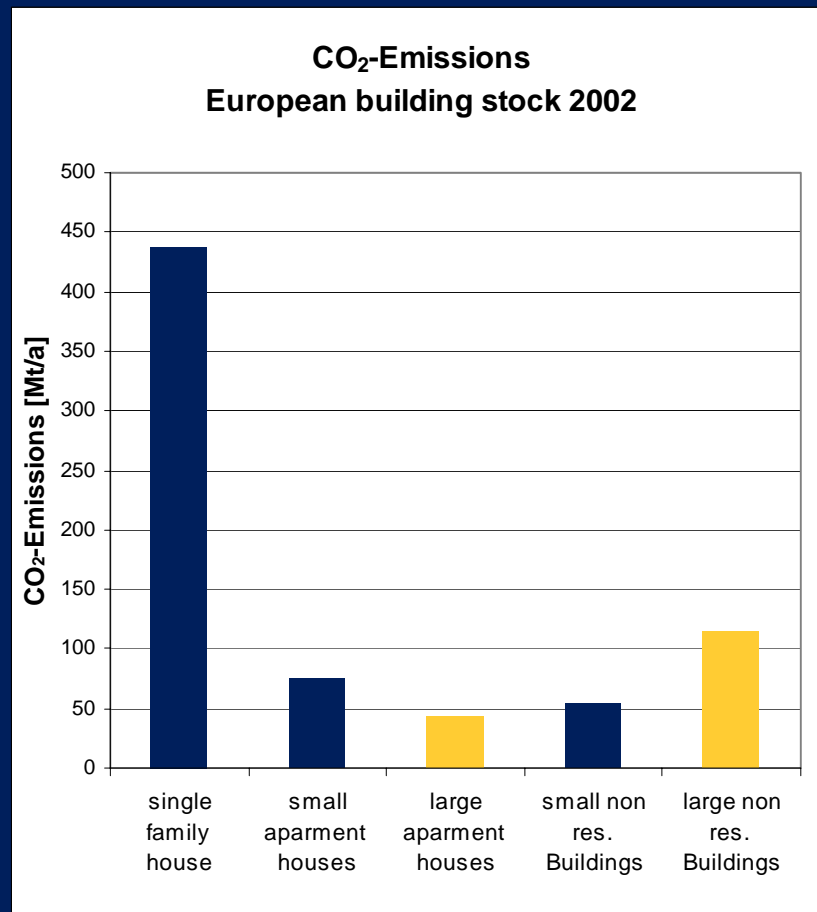
## Why:

- Building sector is the largest end energy user in EU (40%)
- large saving potential in the Building Stock

## Measures:

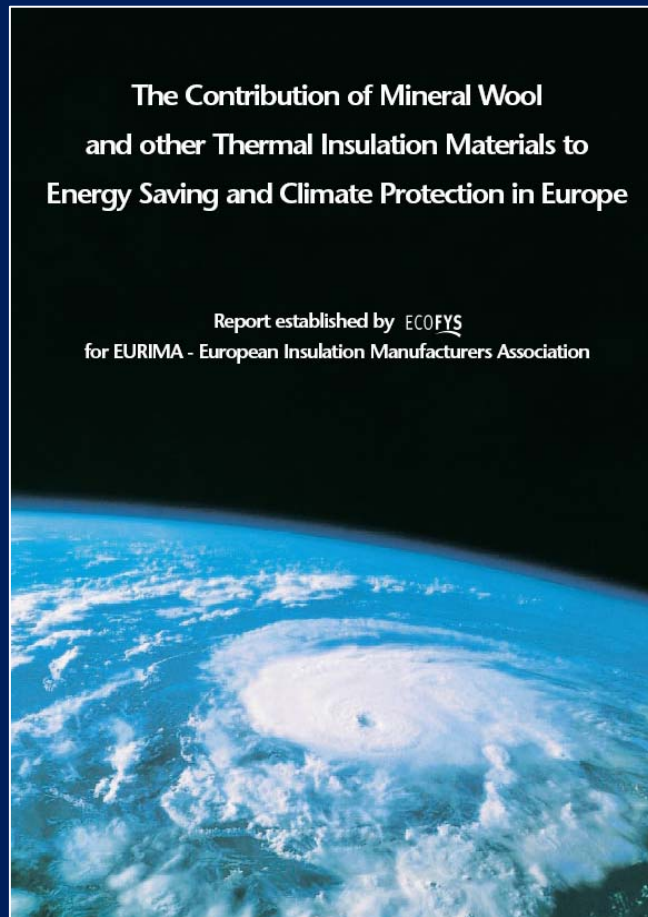
- Establishment of method to calculate the energy performance
- Definition of minimum energy performance standards to new buildings and large (1000 m<sup>2</sup>) existing buildings being retrofitted
- Certification schemes for all buildings (new, sold, rented)
- Regular inspection of heating and air conditioning systems

# CO<sub>2</sub>-Emissions EU-15 Building Stock



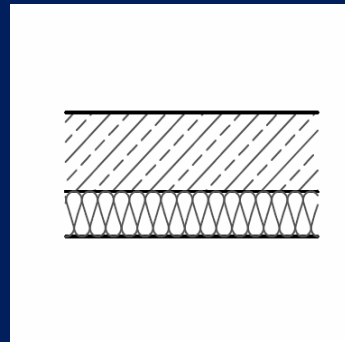
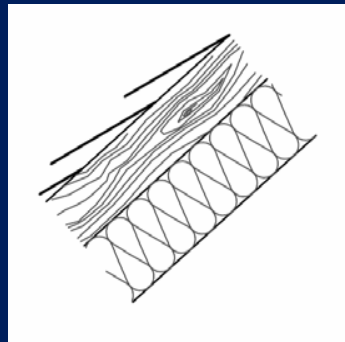
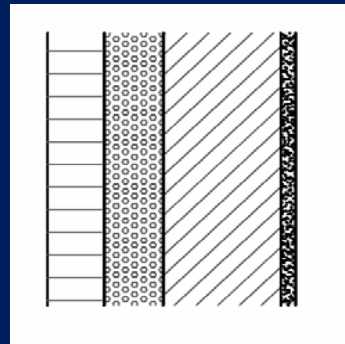
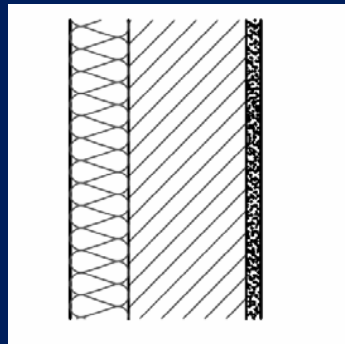
- Total heating related CO<sub>2</sub>-Emissions amounts to 725 Mt/a
- Buildings > 1000m<sup>2</sup> are responsible for about 158 Mt/a (22%)

# BEAM Built Environment Analysis Model



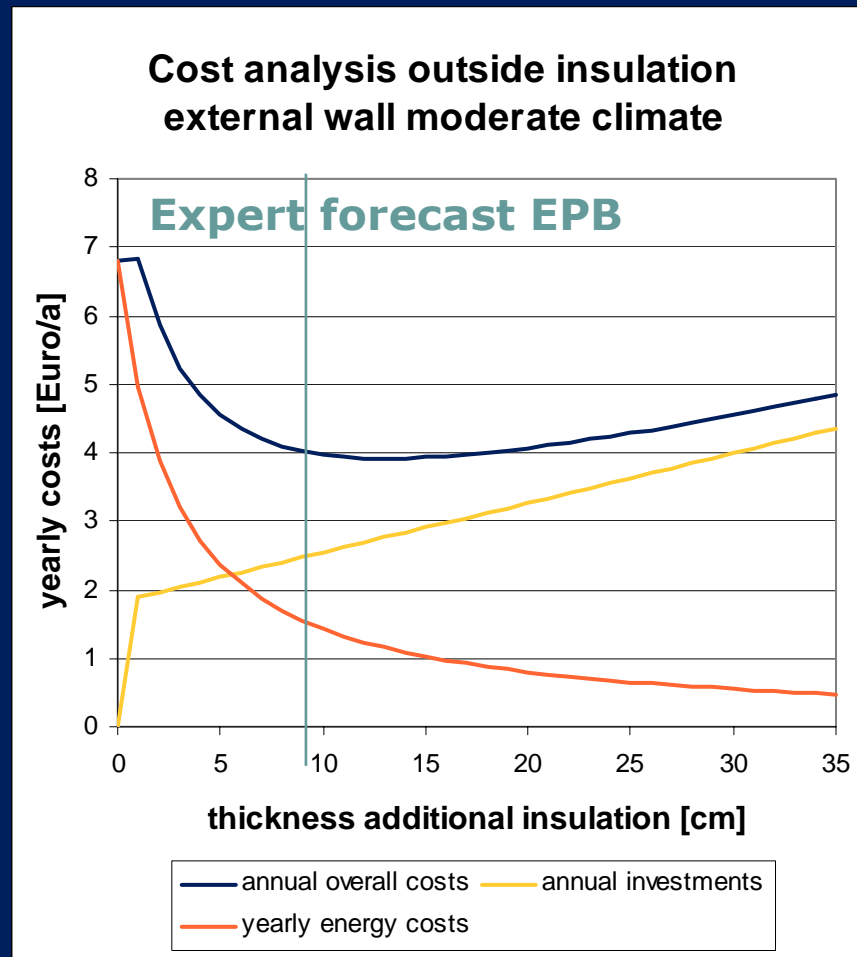
- 3 climatic zones for EU-15
- 5 building types
- 8 insulation standards
- 8 heat supply systems
- 210 standard buildings
- Scenario-Tool Inputs
  - Future insulation standards
  - New construction rate
  - Demolition rate
  - Retrofit rate

# Energy saving measures in Buildings



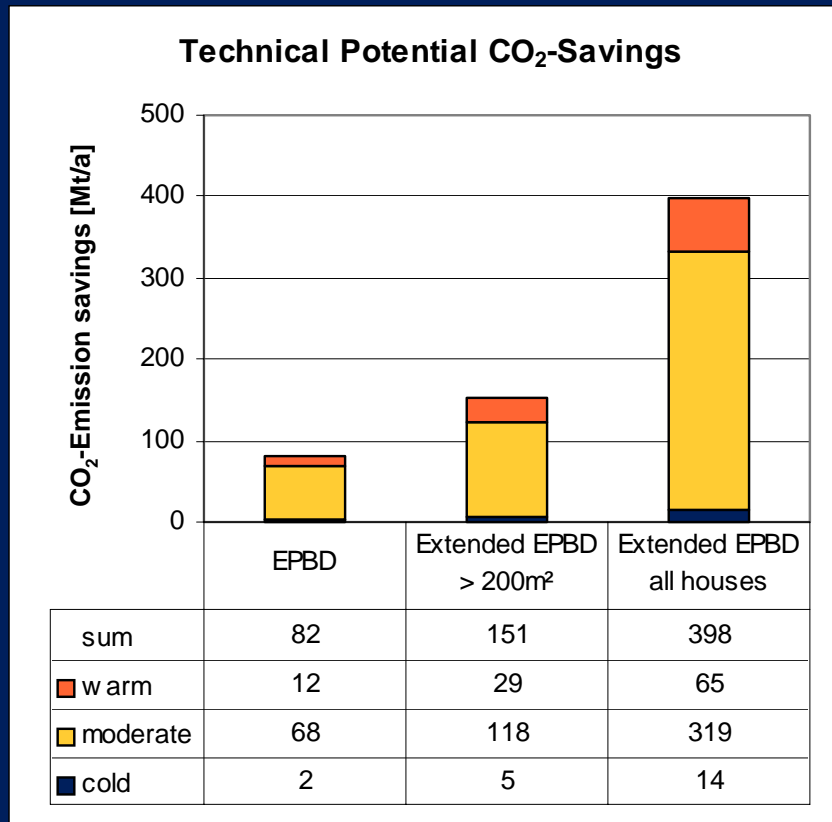
- Investigated measures:
  - Insulation of exterior wall
  - Insulation of roof
  - Insulation of cellar/ ground floor
  - Replacement of windows
  - Replacement of heat generation
- Feasible packages of measures
  - U-values according to expert forecast for the EPBD standard

# Example: Assessment of Measure



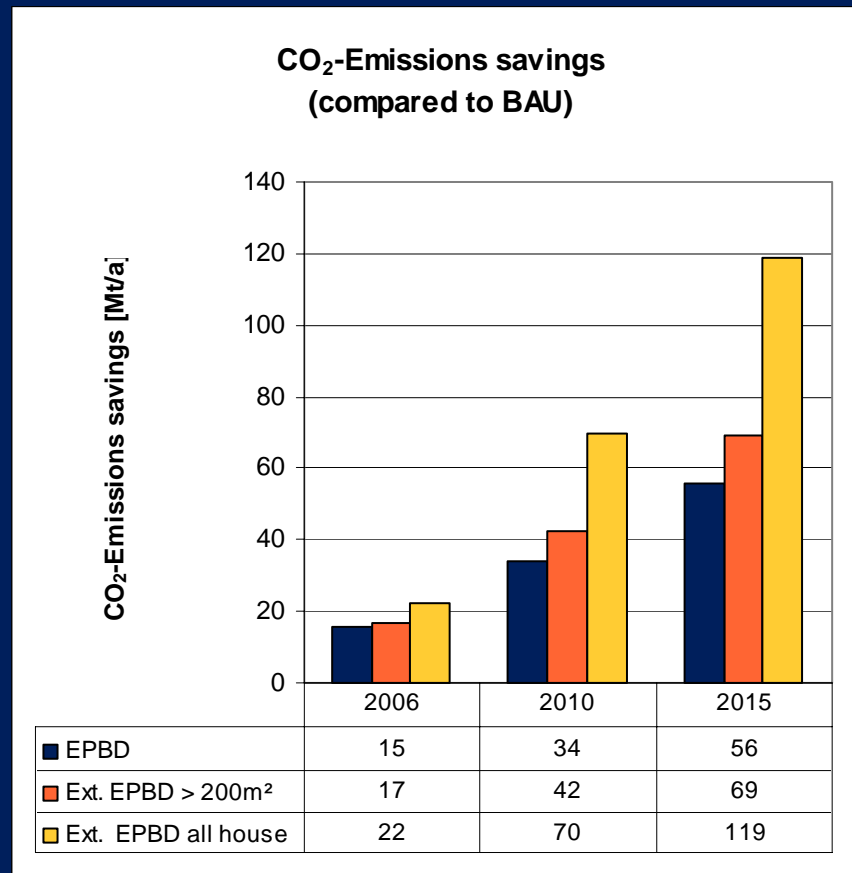
- External insulation wall  
Moderate climate  
Coupled to renovation cycle  
U-value before:  $1.5 \text{ W/m}^2\text{K}$
- Measure is cost effective
- Expert forecast for insulation level after EPB is in the economic range
- Economic potential for further improvements

# Technical CO<sub>2</sub>-Saving Potential



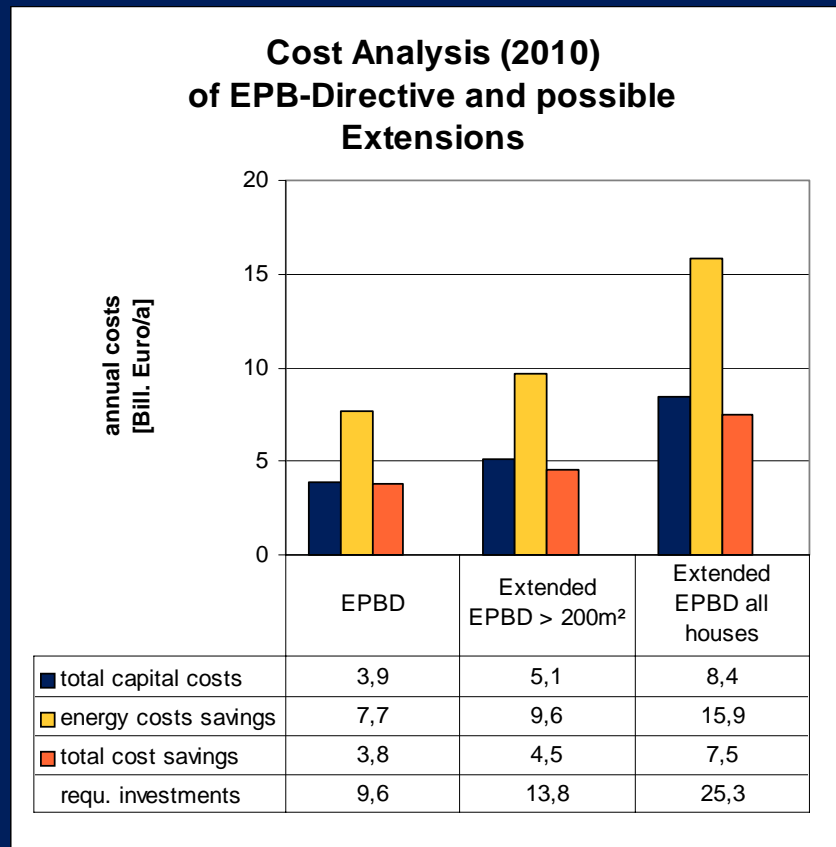
- Technical potential for buildings > 1000 m<sup>2</sup> amounts to 82 Mt/a
- Technical potential for all buildings: 398 Mt/a
- Main potential in moderate and warm climate

# CO<sub>2</sub>-Saving Potential Phased Implementation



- Scenarios: retrofit measures are coupled to renovation cycle
- EPBD results in 2010 in CO<sub>2</sub>-emission savings of 34Mt/a
- Extending the scope of the EPBD to all buildings could double the CO<sub>2</sub>-emission savings

# Economic Impact Phased Implementation



- EPBD and possible extensions lead to additional annual investments of 10-25 Bil. €
- Increase in turnover of building industry of 1%-3%
- All scenarios are cost effective
- Extending the EPBD to all buildings would save 7.5 Bil. € in 2010

## Accelerate EE implementation

- Coupling cost effective energy efficiency measures with general maintenance and retrofit measures
  - Increase energy retrofit rate in EU-15 from 1% to 4%
  - In EU-8 from 0.3% to 3%
- In several EU-countries initiatives have been taken
  - Local governments
  - White certificates
  - Market initiatives

# Boosting the market

1. National and local promotion activities
  - TV and newspaper ads
2. Loans
  - Revolving fund
  - Energy mortgage
3. Financial support
  - Reduced interest rates on loans
  - tax measures, e.g. VAT on certain energy saving products
  - subsidy schemes
4. Legislation
  - EPBD
  - National performance standards

## Conclusions & Recommendations

- Studies have identified very significant cost effective CO2 saving potentials in the EU building stock
- Since energy conservation makes economic sense in all building types it would be sensible to extend the EPB towards smaller buildings
- In economic terms the biggest opportunity is found to be the coupling of energy efficiency measures with general maintenance and retrofit measures
- To boost the energy efficient retrofitting market national schemes are necessary

# Thank you for your attention!

Further information: [www.Ecofys.com](http://www.Ecofys.com)

