4.5 Energy efficient Buildings and Retrofitting

Introduction

The reduction of energy demand is the easiest way to limit the production of greenhouse gases. It is possible with change of behaviour or with higher energy efficiency. Energy efficiency is at the heart of the EU’s Europe 2020 Strategy for smart, sustainable and inclusive growth and of the transition to a resource efficient economy. Objective of the EU is to increase the energy efficiency by 20 percent till 2020. Energy can be saved through increased energy efficiency throughout the whole chain from its generation to its transmission and distribution to more efficient end-use. The greatest energy saving potential lies in buildings next to transport. Both sectors are in the spectrum of town planners and can be influenced by them in a sustainable way. Planners should have a focus on buildings and transportation to increase the efficiency. However, this module will have a focus on buildings; because the issue “mobility” is discussed in Module 4.4 (link).

Focus of activities?

Nearly 40% of final energy consumption is in houses, public and private offices, shops and other buildings. Technologies and measures which are aimed at reducing the use of energy in buildings could have several advantages, such as lower energy bills, increasing comfort of living or working, and reduced impact on the environment, including reduction of CO2 emissions. The options considered for energy savings particularly leading to CO2 emission reductions include the following:

- Use of renewables for heating, cooling and electricity
- Improvements to the building envelope, including materials, natural ventilation and daylighting
- Improvements to building services, including heating, mechanical ventilation and air-conditioning

To trigger a energy saving process in public and private buildings is the key for efficiency. For example is the Energy consumption in households in the EU 27:

- Space heating = 67 %
- Water heating = 14 %
- Cooking = 4 %
- Light and electrical applicants = 15 %

The figures above show that in residential homes around 80% of the energy consumption is driven by heating activities. Addressing heat consumption in buildings should be the prime importance for planners. Retrofitting of the building g stock can lead to energy (and cost) savings up to 75 % (please see examples from Austria, Sweden, and Germany: http://ec.europa.eu/dgs/jrc/downloads/jrc_130508_newsrelease_greenbuilding_en.pdf).

The building stock in Europe should be in the focus of planners. The renovation rate of buildings is low, as is the uptake of the most efficient appliances. Concepts and their implementation in
reality are needed for the building stock. But the European building stock shows that its characteristics differ significantly between Member States in terms of age, type, ownership, renovation rates and energy performance. Therefore, while national policies and regulatory frameworks share common themes, measures to improve the building stock will have to take into account these differences. A 'one-size-fits-all' approach is not appropriate.

However, the development of new settlements is general subject of environmental requirements, which high building standards have a positive effect on the climate protection. For new development of settlements (e.g. residential or offices) the standards up to passive house or energy plus buildings are possible to implement. Nearly Zero-Energy Buildings (NZEB), become the norm for all new buildings in the EU by the end of 2020, and two years earlier for public buildings, see (COM, 2013):

National plans for nearly zero-energy buildings:

http://ec.europa.eu/energy/efficiency/buildings/implementation_en.htm

Stakeholders?

Planners can influence mostly private or public buildings. Publicly owned or occupied buildings represent about 12% by area of the EU building stock. A stronger emphasis on energy efficiency in the public sector is crucial, covering public purchasing, the refurbishment of public buildings and the encouragement of high performance in cities and communities. Public bodies should take the lead in bringing their buildings up to high energy performance levels. In order to achieve this result it would be appropriate for public authorities at least to double the current renovation rate. More than two thousand cities have volunteered to implement sustainable energy measures through the EU-supported Covenant of Mayors. The Covenant is a formal commitment to reduce signatories' CO2 emissions by more than 20% by 2020.

Energy Service Companies: ESCOs deliver energy efficiency improvements, accepting financial risk by covering - or helping to finance - upfront investment costs and refinancing this through the savings achieved. They can help public authorities upgrade buildings by grouping them into scalable projects under energy performance contracts.

Energy performance contracting is an important tool in the refurbishment of buildings. Under this performance-based form of purchasing, monetary savings from lower utility bills and maintenance costs that result from energy efficiency measures are used to cover part or all of the measures' investment costs.
Source: COM(2011) 109 final, Energy Efficiency Plan 2011 see:

Relevant Parameters to be considered

Retrofitting of the building stock: The energy efficiency can be increased via different ways. For example through modified insulation activities or via an efficient energy production, e.g.:
- triple /double glazed windows (more than 40% of windows in the EU are still single-glazing, and another 40% are early uncoated double-glazing)
- new insulated roof
- heat absorption
- dynamic shading devices
- insulation of walls
- installation of heat pumps
- PV
- CHP
- solar heat
- heat recovery air conditioning systems
- avoidance of thermal bridges
- condensing boilers
- ventilation systems
- LED lighting

An integrated urban planning could be a key (e.g. district heating). Smart grids can be a possibility to save energy (e.g. smart meter).

**Finance related aspects**

According to the energy efficiency plan 2011 of the EU (COM 2011) it is possible to achieve huge savings with energy efficiency. Combined effects of full implementation of the existing and new measures have the potential to generate financial savings of up to € 1 000 per household every year (COM 2008 772: Communication from the Commission: Energy efficiency: delivering the 20% target); improve Europe’s industrial competitiveness; create up to 2 million jobs (SEC 2011 277: Impact Assessment accompanying the Energy Efficiency Plan).

Energy performance contracting is an important tool in the refurbishment of buildings. Under this performance-based form of purchasing, monetary savings from lower utility bills and maintenance costs that result from energy efficiency measures are used to cover part or all of the measures' investment costs. This model has been tried and proved cost-effective in a number of Member States.

In order of the EU the company Ecorys have dome an analysis of the investment potential for energy efficiency in buildings and of the use of financial instruments at national level.


According to a study from the German Institute of Economic Research (DIW) from 2014 energy efficiency measures are directly linked with economic growth!

"As part of the energy transition process, the German government has set far-reaching energy efficiency targets, including doubling the annual energy-efficient refurbishment rate for existing residential buildings from one to two percent. DIW Berlin has estimated the additional energy-related investment required to meet these targets and analyzed the impact this could have on the economy. In the long term, the savings on household energy bills far exceed the additional investment. This, combined with further measures to increase energy efficiency in other sectors, substantially reduces energy consumption and greenhouse gas emissions. Even allowing for some elements of uncertainty, these measures to improve energy efficiency have a positive impact on income and domestic demand. They could also result in significantly positive effects on employment, depending on the ratio of productivity gains and new jobs. Nevertheless, the most recent savings are not nearly enough to achieve the German government's energy efficiency targets. Clear and reliable framework conditions are needed soon to increase the number of buildings being refurbished for energy efficiency. Given the present analyses, which indicate that forcing the pace of energy efficiency improvements has a positive impact on German economic growth and employment, the government's hesitation seems even less justified." Source: http://www.diw.de/sixcms/detail.php?id=diw_01.c.435674.de