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Energy Efficient Residential Housing: Chances and Challenges

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Introduction

Ladies and gentlemen,
it gives me great pleasure as the president of the German Federal Environment Agency to give the keynote speech at the International Forum “Towards an Action Plan for Energy Efficient Housing in the UNECE Region”.

Let me thank you for the invitation.

It is my firm conviction that energy efficiency and economic development are not mutually exclusive; energy efficient residential housing contributes to both: climate protection and economic growth. Energy efficient residential housing not only reduces greenhouse gas emissions and the need for energy imports but leads to more employment, a higher standard of living and human health.

Energy efficiency as an answer to climate change and limited natural resources

Already today we can see changes in climatic conditions in our daily life. In recent years we experienced more heavy rainfall, stronger storms, and extremer heat waves in Europe and even more in other parts of the world. At the same time we observe extremely destructive natural catastrophes. In 2002 flooding at the Elbe caused more than 20 Billion Euro of damages in Central Europe.¹ Hurricane Katrina in 2005 was the sixth strongest hurricane registered since 1851 – causing 125 billion Dollars of damage, the most expensive natural catastrophe loss in history.² The power of extreme weather events destroys infrastructure, paralyses the economy and is fateful for many people.

Sir Nicholas Stern, former Worldbank Chief Economist, investigated in his famous report the economic consequences of climate change. I repeat his key message here, since I consider it as extremely important: **The cost of mitigating climate change by cutting greenhouse gas emissions are moderate compared to the high cost of global warming.** Between one and two per cent of GDP are necessary to avoid the worst economic consequences of global warming – if we start to act now. Without action the cost of climate change range between 5 to 20 per cent of world GDP.

As we prepare for Copenhagen in only a few weeks our generation still holds the key to lay the foundation for prosperity and wealth in coming centuries. However, scientists clearly tell us, that a temperature increase by more than 2 degrees Celsius above the preindustrial level will bear the risk of uncontrollable climatic consequences.

Besides the challenge of global warming, mankind is also faced with **a limited supply of fossil energy and natural resources** at the same time as global demand for products is increasing due to a growing population. To fill the gap between supply and demand it is crucial to increase energy and resource productivity.

Therefore I see energy efficiency as a key element to successfully address the challenges stemming from global warming and limited resources. It is the key for sustainable housing as well as for sustainable development altogether.

¹ Sources: Munich Re (2003) „Topics. Annual Review: Natural Catastrophes 2002“ and DKKV (2003) „Hochwasservorsorge in Deutschland – Lernen aus der Katastrophe 2002 im Elbegebiet“, <http://www.dkkv.org/DE/publications/ressource.asp?ID=70>

² Munich Re (2006), Topics Geo Annual review: Natural catastrophes 2005 http://www.munichre.com/publications/302-04772_en.pdf

Emission reductions, energy efficiency and political goals

Ladies and gentlemen,

to fight global warming the **European Union** adopted an ambitious climate package last year. The EU committed to an **emission reduction target** of minus 20 per cent by 2020 compared to the base year 1990. This reduction will be raised to 30 per cent as soon as an international follow-up agreement to the Kyoto Protocol is in place. In addition, the European Union aims to increase renewable energies to a share of 20 per cent of final energy demand and increase energy efficiency to save 20% of EU energy consumption by 2020.

All these targets are milestones to the **ultimate goal**: To limit global warming to a temperature increase of no more than **two degrees**. Of course the EU is only a small part of the world – however, it is economically strong. Ambitious and successful climate policies of some leading countries are the best argument to convince other countries to also commit to drastic emission reductions. Of course a carbon free economy by 2050 is a huge challenge. However, low carbon and no carbon economies are likely to be the most competitive on world markets in the future as fossil energy resources are becoming scarcer and scarcer. Our goal must be to reach a carbon neutral society by the mid of the century, with heat, electricity and transportation based on renewable energies.

Germany set the **goal of 40 per cent reduction** in greenhouse gas emissions by 2020 compared with 1990. In order to reach this target Germany is pursuing a twin-track strategy: a reduction in energy consumption through energy efficiency measures and the use of renewable energies. With respect to space heating and industrial heat this means a goal of 14 per cent renewables and a share of 25 per cent of electricity from combined heat and power.

Energy use in housing has a huge impact on global warming. More than 1/3³ of CO₂-emissions within the European Union is directly caused by residential and commercial buildings – mainly to heat space and water.

There are **numerous possibilities to cut emissions**. Greenhouse gas emissions can be avoided by

- **Better insulation** of buildings. This reduces energy use at the same time as it improves human health through a better comfort of living.
- **Modern heating systems** need less gas and oil, which reduces the need for expensive energy imports.

³ Council of the European Union (2009), Impact Assessment for the react of the Energy Performance of Buildings Directive (EPBD)

- Using more **renewable energies** in the heating market can further reduce demand for fossil fuels and is the only way for a sustainable energy use in the long run.

Good insulation, modern heating systems and thermal windows are worthwhile also in **monetary terms**.⁴ If energy related investments are coupled to other renovation activities – which is usually possible – emission abatement investments lead to net cost savings under current market conditions. This is the case for an upgrading of existing buildings to a good energy performance level as defined by the EU Energy Performance of Buildings Directive in old as well as in new EU member states.⁵ Also on the global scale the IPCC estimates that about 30 per cent of projected greenhouse gas emissions of the building sector can be cut with net economic benefits by 2030.⁶ Talking about the cost of energy efficiency we have to keep in mind that energy prices are expected to rise. Therefore energy efficient solutions will become more urgent as well as more profitable every day.

⁴ Umweltbundesamt (2008) "Wirtschaftliche Bewertung von Maßnahmen des integrierten Energie- und Klimaprogramms (IEKP) - Wirtschaftlicher Nutzen des Klimaschutzes" Climate Change 14/2008, <http://www.umweltdaten.de/publikationen/fpdf-l/3517.pdf>, McKinsey (2009) „Kosten und Potenziale der Vermeidung von Treibhausgasemissionen in Deutschland“ http://www.bdi.eu/download_content/Publikation_Treibhausgasemissionen_in_Deutschland.pdf

⁵ Sources: Ecofys (2005) "Cost-Effective Climate Protection in the Building Stock of the New EU Member States Beyond the EU Energy Performance of Buildings Directive", <http://www.rockwool.com/files/rockwool.com/Energypercent20Efficiency/Library/CostEffectiveClimateLeaflet.pdf> and Ecofys (2005) "Cost-Effective Climate Protection in the EU Building Stock" http://www.eurima.org/uploads/ModuleXtender/Documents/94/documents/ecofysIII_report_EN.pdf

⁶ IPCC, WG III SFP, p. 13, <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf>

The broader picture of energy efficient residential housing in Europe and Germany

Sometimes people recognise the threat of global warming but ask if ambitious reduction targets are economically too challenging. However, I see that as the **wrong question**. We rather have to ask:

- How long can we afford to do business as usual in residential housing?
- How long do we want to waste huge amounts of precious energy?
- How long do we want to be dependent on finite oil and gas supplies?
- How long can we accept energy poverty and unhealthy living conditions in run down houses?

We have to stop seeing energy efficiency as an isolated issue. Asking for a better way of life in Eastern as well as in Western Europe we will find that raising energy efficiency is the key. Energy efficient residential housing contributes not only to climate protection but also to a higher standard of living. Energy efficient housing reduces the need for precious fossil resources and reduces spending on energy import and increases domestic demand. Energy efficient housing is a crucial factor to improve human health.

Due to lower income, **former socialist countries** are often particularly challenged to improve energy efficiency. However, we also have to see the large investment needs in those countries: in infrastructure and also in housing. Therefore I see it as a big chance that new investments improve the comfort of living at the same time as the energy efficiency of housing. For such investment there is the **real chance for leapfrogging**. The model is not western European buildings from the eighties of the last century but low and zero energy houses developed in recent years.

Energy efficiency goes beyond efficient housing: **district heating** is well developed at many places in Eastern Europe and hopefully becomes also more important elsewhere. Faced with the threatening global warming, district heating becomes more interesting also in the Western Europe. District heating does not only raise the question how to establish and maintain heat grids but also how regional planning can contribute to urban structure that is suitable for such solutions.

For this, you might have a brief look in our UNECE workshop program for tomorrow: An expert from my Agency⁷, from the **Spatial Environmental Planning Department**, will contribute to the question of how to see energy efficiency on a more strategic and interrelated planning level. We believe that spatial arrangement of buildings, the overall settlements, and their service infrastructure are key factors to increase energy

⁷ Presentation by Mr. Wende on day 2 in the Plenary Session III “Spatial arrangement of buildings and their service infrastructure to increase energy efficiency in housing”

efficiency in housing, not only in Germany, but also in the international context. A new UNECE Action plan should therefore incorporate these spatial planning climate protection issues, too.

A low carbon society and energy efficient housing: success stories

A low carbon and energy efficient society is more than a vision. Numerous success stories exist already today. Let me mention some:

In its large scale programme “**Efficient homes**” the **German Energy Agency** (DENA) demonstrated that energy demand of existing buildings can be reduced on average by 88 per cent - which is even 60 per cent below the strict current standard for new buildings in Germany.⁸ One example for such a retrofit is an apartment house built in Berlin in 1886. Its primary energy demand was reduced from over 270 to less than 40 kilowatt hour per square meter and year by insulation, solar energy and air conditioning with heat recovery and a gas-fired condensing boiler.

The programme “50 Solar Energy Housing Estates in the [German State] North Rhine-Westfalia“ proved as very successful.⁹ Besides promoting the use of solar energy the programme also requires high energy efficiency standards. To be eligible for public funding solar energy housing estates have pass strict inspections by a special commission. By now there exist 29 housing estates with about 2800 apartments, 18 housing estates are under construction.

The examples show that public funds are one success factor. However, it also proved to be very important to establish a **network of existing regional competence centres** to increase the multiplier effect of energy-efficient refurbishment, with new partners joining the network constantly. Within these networks highly qualified energy consultancies are essential.

In this context, it might be very interesting for you to hear from large scale retrofitting of existing buildings in the **former socialist part of Germany**. Nowadays the share of retrofitted houses in Eastern Germany is around 50 per cent whereas it is below 20 per cent in Western Germany.¹⁰

⁸ <http://www.dena.de/en/topics/buildings/projects/projekt/efficient-homes/>

⁹ <http://www.ea-nrw.de/solarsiedlungen/page.asp?TopCatID=6197&RubrikID=6197>

¹⁰ This is the case of houses represented by the GdW (Bundesverband deutscher Wohnungs-Immobilienunternehmen). The numbers read as 50 per cent completely energetically modernized buildings in East Germany compared to 18.6 per cent modernized buildings in West Germany in 2007.

Challenges and policies

Ladies and gentlemen,

Let me now come to the challenges of energy efficient residential housing and the policies that are necessary for a sustainable development. Despite huge reduction potentials we have to acknowledge numerous **challenges and barriers** that have to be overcome to actually cut emissions from residential housing.

- First of all, the **life cycle of buildings** is long and investments needs are very large compared to other investment decisions. Residential houses are built for 50 to 100 years and more. Investors have to take into account uncertainties with respect to energy prices, climatic conditions and the needs of an aging society.
- The long life cycle of buildings means for Europe that 75 per cent of today's building stock will still be there in 2050.¹¹ Therefore we do not only need energy efficient new buildings but even more **ambitious retrofits** of existing buildings that cut emissions drastically. Unfortunately, today retrofits are often undertaken without improving the energy efficiency of buildings. Energy related renovations are much cheaper if they are coupled to regular renovations. Therefore retrofits without improved energy efficiency are missed opportunities and a huge obstacle for future improvements.
- What we need are **strict minimum efficiency standards** not only for new buildings but also for retrofits. In 2020 we must discuss if a zero energy house instead of the passive house can become the standard for renovations.
- An additional problem is the poor enforcement of legal requirements. Estimates for Germany indicate that only 60 per cent of the required improvements are actually undertaken.¹² Therefore we do not only need to have a strict regulation but also a **strict enforcement of the law** so that a low energy use and renewable energies are not best practice but common practice.
- A large obstacle in the energy saving refurbishment of existing buildings are **split incentives of renters and tenants**. Landlords often hesitate to invest in energy efficiency since they do not expect to profit sufficiently. Tenants are reluctant to pay higher rents as long as they are not convinced that their operational costs will decrease. This problem of split incentives can be overcome by **better information and transparent markets**. Energy certificates can inform on the energy efficiency of a flat. Governments need to create favourable conditions that such certificates are widely used so that market prices eventually also reflect the thermal state of the building. In Germany we are trying to incorporate the energy

¹¹ This holds for the European Union (Council of the EU (2009), Impact Assessment EPBD).

¹² Kleeman und Hansen (2005): Evaluierung der CO₂-Minderungsmaßnahmen im Gebäudebereich.

efficiency as one factor to determine the typical rent within a city or local community – which is a legal term to determine a non-binding recommended level of rent. The city of Darmstadt has made very positive experience with this approach. With reference to the local rent index landlords can demand almost half a Euro more rent per square meter and month if the building is classified as very energy efficient.¹³ This sets high incentives for renovations and makes it possible for the renters to judge the thermal state of a house.

- For **tenancy law**, we have proposed a provision which would require tenants to tolerate such renovations carried out by the landlord only if they meet at least the legal efficiency requirements for buildings. Such a provision would at the same time lead to improved enforcement of and compliance with the legal requirements, and could prevent a lot of unambitious renovation projects that would perpetuate a poor efficiency status for decades to come.
- In addition, some building owners and building contractors **know little** about thermal insulation and other possibilities for saving energy in buildings. Reservations from a structural and design point of view are also still widespread. Often, preference is given to renovations that materialise in the short term, such as renovating bathrooms or balconies, while the long-term benefits of improved thermal insulation, for example, are overlooked. It is therefore a high priority for governments to make information on energy efficient construction readily accessible to anyone who needs it. We need to systematically improve the qualification of people working in the construction sector, because modern energy efficient construction requires highly skilled workers.
- Private, non-commercial building owners often hesitate to make high financial investments for energy efficient buildings. **Publicly supported loans and also direct subsidies** have proved very effective in overcoming this barrier. Public funding does not only encourage energy efficiency but should also make sustainable housing affordable for low income groups and reduce energy poverty.

I am sure that many of the issues I have addressed not only apply to Germany, but that these or similar problems also exist in all UNECE countries. It is obvious therefore, that improved cooperation between our countries' competent authorities in tackling this common task would be very helpful and desirable.

¹³ See also Umweltbundesamt (2009) „Konzeption des Umweltbundesamtes zur Klimapolitik“, p. 74.

Action Plan for Energy Efficient Housing

Excellencies, Ladies and Gentlemen,

Despite of all this obstacles and barriers, what we need for an Action Plan for Energy Efficient Housing is actually quite simple. The three corner stones are:

- We need **cross-sectoral policies like energy taxation and emissions trading** so that energy prices reflect the economic as well as the ecological truth.
- Before the end of the decade we need to talk about **zero energy homes as the minimum efficiency standard** for new as well as for existing buildings. Under such conditions the necessary wide **use of renewable energies will be a matter of course.**
- We need **public funds** so that energy poverty can be overcome and energy efficient buildings are affordable also for low income groups. An intelligent public funding programme can also overcome financial barriers of energy efficiency investments and ensure that information needs of investors are addressed.

Economic chances of an Action Plan on Energy Efficient Housing

Such an Action Plan is not only a challenge but also offers big opportunities. They are numerous and justify all the efforts which are undertaken. Energy efficiency not only reduces greenhouse gas emissions, but it is also a business opportunity as it is highly cost-effective already under current market conditions. Thus, it is economically as well as environmentally beneficial. Market studies project a growing demand for **energy efficiency technologies**. The global market potential of these technologies was estimated to be around 450 billion euro in 2005, and growth to over 900 billion euro is predicted by 2020.¹⁴

The market for energy efficiency and environmental goods and services is a big chance for our economies. Let me tell you about the **German experience**. In past decades, German and European environmental policy has guided the way with targets and limit values in many fields. Of course this required substantial investments. However, there are numerous examples where German companies are now world market leaders. These include the fields of renewable energies, energy efficiency and air pollution control. The facts speak for themselves:

- Germany is yet again the export world champion in potential environmental goods.
- In 2006, Germany's share in world trade was 16 per cent. This corresponds to an export volume of 56 billion euro.
- The export of potential environmental goods is also an important source of employment. Around 1.8 million people work in the environmental sector in Germany. This is already 4.5 per cent of the total labour force.

Therefore, it is not sufficient to only look at upfront investment costs to decide on the most economical solution. We also have to take into account the **positive long term effects**: Energy efficient buildings lower operational as well as environmental costs through ambitious environmental policies. They create a demand for innovative solutions and create jobs for highly trained workers in the construction sector.

But also beyond the building sector energy efficient houses can create hundreds of thousand **new jobs** and sustainable economic growth. Improved energy efficiency through better heat insulation boosts the purchasing power of homeowners and tenants as their heating costs drop. Modernisation of heating systems in buildings also cuts the demand for gas and heating oil imports, which in turn will stimulate domestic demand and counteract Europe's high level of dependency on energy imports. At the same time, the large-scale investments necessary to remediate building stock will open up new employment opportunities, mainly in the construction industry and in related services such as construction financing. Studies show that in

¹⁴ Umweltbundesamt und Bundesumweltministerium (2009) "Umweltwirtschaftsbericht 2009", p. 98

Germany speedy and thorough implementation of climate protection measures in buildings alone will create over 350.000 jobs by 2020.¹⁵ For Eastern European EU member states up to 185,000 new jobs can be created by implementing the EU Energy Performance of Buildings Directive.¹⁶ In sum, this will stimulate the economy and provide growth and employment.

Therefore the **economic stimulus programmes** currently being launched worldwide to counter the economic recession must not be geared to conserving existing structures; they must lead to the restructuring of our economies towards greater efficiency and less carbon.

One possibility in that direction are public funds like the “**Energy-Efficient Construction**” programme of the public German KfW-Bank. This programme supported retrofits with almost 6 billion Euro in the last four years and further increased in volume in response to the world financial and economic crises. The funds are used to finance low-interest loans and subsidies for measures to improve energy efficiency and for energy-efficient new buildings. In 2008, over 100,000 loans and subsidies worth 6.4 billion euros were granted. Between 2006 and 2008, some 800,000 flats were rehabilitated or built to particularly high energy-efficiency standards, resulting in an annual reduction in CO₂ emissions of almost 2.4 million tonnes.

Ladies and Gentlemen,

let me come to **the end**. Global warming is already reality today. We have to act now to avoid high damages in the future. Increasing energy efficiency in residential housing is one of the most important fields to demonstrate and prove that a low carbon society is more than a vision but reality in Europe by the mid of this century.

¹⁵ Umweltbundesamt (2009) „Gesamtwirtschaftliche Wirkungen von Energieeffizienzmaßnahmen in den Bereichen Gebäude, Unternehmen und Verkehr“, Climate Change, <http://www.umweltdaten.de/publikationen/fpdf-l/3763.pdf>

¹⁶ Number refers to the 8 new members Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Ecofys (2005): Cost-Effective Climate Protection in the Building Stock of the New EU Member States <http://www.rockwool.com/files/rockwool.com/Energy%20Efficiency/Library/CosteffectiveClimateReport.pdf>