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ENERGY EFFICIENCY IN HOUSING

COSTS AND BENEFITS OF ENHANCING THE ENERGY EFFICIENCY OF EXISTING HOUSING STOCK IN LOW-INCOME COUNTRIES IN EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA AND SOUTH-EASTERN EUROPE

Note by the secretariat

Summary

The short note below was prepared by the secretariat to stimulate discussion on the issue of energy efficiency in the housing sector at the Committee on Housing and Land Management's sixty-ninth session as requested by the Bureau meeting (ECE/HBP/2008/10).

The note will be further elaborated and presented at the session. A more detailed note integrating the concept note (ECE/HBP/2008/2) as well as information gathered through the discussions at the Committee session, will also provide useful background for the subsequent workshops on the subject, should the Committee approve the proposed programme (see ECE/HBP/2008/2).

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I. TECHNOLOGIES EXIST BUT ARE NOT ALWAYS AVAILABLE OR AFFORDABLE

1. Energy reduction in housing has been a major field of research in recent years in more developed countries, both for existing housing and for new housing construction. The future challenge, however, will be to increase energy conservation in low-income countries.

2. A wide range of effective, mature and affordable technological solutions to enhance energy efficiency exist. This range includes, among others, insulation materials and techniques, high-reflectivity building materials and multiple glazing, high-efficiency lighting and appliances, highly efficient ventilation and cooling systems, solar water heaters and passive solar designs.

3. The variety of existing technological options means that large scale energy efficiency programmes in the housing sector are technically feasible, although availability and affordability for lower-income countries in Eastern Europe, Caucasus and Central Asia (EECCA) and South-Eastern Europe (SEE) remains a major obstacle. Since technology originates primarily in developed countries, it is necessary to encourage and facilitate the application and availability of that technology in low-income countries through investment, trade, or technology transfer programmes which can be easily applied, are not too expensive and can be reproduced. This can often only be achieved through policy interventions at the national and international levels.

4. Non-technological options, such as occupant behaviour or the impact of culture on consumer choice, are major determinants of energy use in buildings and may play a significant role in reducing carbon dioxide (CO_2) emissions (IPCC 2007[1]). Although the potential reduction through non-technological options and the potential leverage of policies and education over these options are still not well researched and understood, existing evidence suggests that significant savings can be generated from these non-technological sources.

II. BENEFITS, CO-BENEFITS AND COSTS

5. It should be clear from the Concept note (ECE/HBP/2008/2) that increasing energy efficiency in the existing housing stock makes sense from an environmental point of view. Prior to the implementation of large-scale energy-efficiency programmes, however, it is important to know whether they make economic sense. To answer this question, one has to look at two levels.

6. The first level is macro/global. At this level, the question of economic rationale has been answered in unequivocal terms by the benchmark study on this topic, the 2006 Stern Report, which concludes that delaying action in curbing CO_2 emissions will most likely result in unsustainably increasing costs for mitigation and adaptation or, even worse, irreversible damage with unpredictable economic consequences. Investing in energy efficiency is therefore an economically rational decision.

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[1] "Residential and commercial buildings", in *Climate Change 2007: Mitigation*, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2007.

7. The second level looks at the question of costs and benefits from the narrower angle of cost-benefit analysis. At its core, such analysis considers, on the one hand, the costs of the programmes and, on the other, the energy savings they are expected to generate.

8. A key parameter in this analysis is payback times of investment, which in turn depend on the costs of energy-saving technologies and the costs of energy supply. In this regard, the United Nations Environment Programme (UNEP) has observed that "Low, subsidized energy prices in many developing countries imply very long payback periods of up to 25 years for energy efficiency investments, which renders such projects unprofitable" (UNEP 2006[2]). Similarly, the European Environmental Agency (EEA) has concluded that "In the final analysis, the economic incentive for retrofitting will exist only if energy tariffs are set high enough. […] When the full cost savings are included, with reduced costs for municipalities, retrofit projects have a much shorter payback period" (EEA 2007[3]). In this sense, and despite their otherwise significant negative economic impact, the currently high energy prices create a favourable climate for improved energy efficiency in low-income, as well as in developed, countries.

9. A rather particular subset of countries, where a separate type of cost-benefit analysis might be required, is formed by fossil fuel-rich countries. These countries are often among the least concerned with energy efficiency and subsidized prices are often observed. From their perspective, an alternative way of assessing costs and benefits is to examine the question of payback times from the angle of opportunity costs. How much more would an oil-producing country earn if, due to increases in energy efficiency, savings in oil quantities used in subsidised domestic markets were sold instead at world prices in international markets? Increased earnings, in turn, could be used to fully finance or subsidize necessary investment that would lead to further gains in energy efficiency, thus creating a virtuous policy cycle.

10. More recent studies have argued convincingly that an analysis of direct costs and benefits is rather limited and therefore may underestimate the true benefits of energy efficiency programmes. It is therefore important to also take into account so-called co-benefits (positive externalities).

11. These positive externalities include increased energy security, the creation of jobs and business opportunities, heightened economic competitiveness and improved industrial productivity in the short- and medium-run, as well as poverty alleviation and improved social welfare, better indoor and outdoor air quality, greater comfort, reduced mortality and morbidity and enhanced health (IPCC *ibid*, p.389; UNEP *ibid*).

12. In summary, one can say that the consensus in the economic and policy literature is that, subject to the high price and insecurity of fossil fuels, the cost-benefit analysis of energy efficiency programmes is favourable to the undertaking of energy efficiency programmes, regardless of whether benefits are defined in narrow or broader terms.

III. BARRIERS TO EFFICIENCY

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[2] UNEP, *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings, Report for the UNEP-Sustainable Buildings and Construction Initiative* [Sonja Koeppel, Diana Ürge-Vorsatz], Budapest: Central European University], 2007, p.60.

[3] European Environmental Agency Report, *Sustainable consumption and production in South East Europe and Eastern Europe, Caucasus and Central Asia*, Copenhagen, No 3/2007, p. 120.

13. The above analysis has shown that promoting energy efficiency in the existing housing stock makes environmental and economic sense in a context of scarce and increasingly high-priced non-renewable energy resources. Why, then, is investment lagging and, more importantly, what policies are available to help change the situation?

14. As underlined in the concept note (ECE/HB/ 2008/2), in EECCA and SEE countries there exist a number of barriers that do not allow the use of the full range of options currently available. Some of these barriers are specific to the region – namely, a weak public sector with no or insufficient housing budgets, outdated building codes, little knowledge within the local construction sector about new technical improvements, low levels of research activity both in the public and private sectors, and a market dominated by high demand rather than by sufficient supply, weakening the role of critical consumers. Other barriers are more global in nature.

15. Global barriers include the lack of reliable information on energy efficiency measures, market failures that lead to lack of proper incentives at the individual level (e.g. landlords who would pay for energy efficiency equipment and tenants who would gain from such investments), limitations in access to financing and subsidies on energy prices (IPCC *ibid*).

IV. AREAS TO BE ADDRESSED

16. The section below highlights some important policy issues which should be taken into consideration while promoting energy efficiency in housing. These issues can provide some additional ideas for discussion during the Committee session on energy efficiency in housing.

17. Three key policy-related issues have been identified by the paper. First, over the total housing stock, the most significant portion of carbon and energy savings by 2030 will be made in retrofitting existing buildings and replacing energy-using equipment (IPCC *ibid*). Second, there is a wide range of mature and cost-effective technologies and know-how that have not been widely adopted in the developing or developed countries (IPCC *ibid*, p.389). Third, there exist non-technological (usually behavioural and demand-side) solutions to attaining significant energy conservation in the housing sector which have not been fully integrated in policymaking.

18. The effectiveness of policy instruments will be enhanced if they are part of a strategic framework in which energy conservation becomes a high-priority national goal, e.g. improving the energy efficiency of existing buildings over a defined period. These policies could be linked with broader ones related to housing maintenance and retrofitting.

19. The effectiveness of policy will be further increased if choices are based on a strategy that prioritizes feasibility and impact, starting with easier yet effective measures first. One example of a simple to implement yet effective measure would be the establishment of national lighting efficiency standards coupled with the phasing out of traditional inefficient (i.e. incandescent) light bulbs within a reasonable amount of time (say, 10 years) following the adoption of the policy.

20. There are a number of existing technologies that are effective, mature and increasingly affordable. In order to ensure that these technologies are available at affordable prices, supply (from developed countries) must meet demand (from low-income countries) through

comprehensive investment and trade polices as well as technology transfer programmes aimed at exporting climate-friendly technologies, including green buildings.

21. Capacity-building and training are essential elements in any national plan to ensure an energy-efficient building stock. While the training of a country's own architects and other construction-related professions is a medium-term solution, technical assistance through international consultants and organizations can offer a temporary yet effective solution in the short term. However, the issue of training needs to be addressed immediately in order not to rely on external help and expensive solutions.

22. From an institutional point of view, the creation of a properly staffed energy agency can greatly contribute to better coordination of national efforts, as well as increased technical and policy capacity.

23. The lack of information and awareness are among the major barriers to generating sufficient bottom-up demand for environmental housing in low income countries. Awareness can be raised through extended information campaigns, or through pilot projects administered and financed by international organizations or bilateral donor agencies. Energy efficiency should also be promoted through the exchange of best practices and regional cooperation programmes.

24. The establishment of incentives for early adoption of energy-saving measures can go a long way to accelerating their introduction. For example, one option would be the extension of "early-bird" grants for early adopters (e.g. municipalities, communities or other administrative units appropriate in each country), to reward those localities that take the first steps in implementing energy efficiency retrofits for existing buildings.

25. The supply side needs to have the right incentive structure as well. To achieve this, profits should be decoupled from increased energy usage. Instead, incentives for energy conservation should be provided to ensure that utilities see increased profits for improving energy efficiency. Such an incentive structure would align utilities' and consumers' interests.

26. The higher initial cost of energy efficient technologies may still delay their application in EECCA and SEE countries, especially since these technologies often have to be imported. They should be locally produced and applicable.

27. Poorer consumers will need financial support or affordable loans to encourage investment. It is possible that low-income countries can, at least partly, raise money through public benefit charges or taxes to implement such support programmes. Most likely, however, they will also have to rely on bilateral or multilateral international assistance for pilot projects, which should be easily replicable.

28. Governments should be the leaders in the effort to save energy, by assessing the energy efficiency of existing government buildings and introducing measures to drastically increase energy conservation.

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