United Nations Environment Programme
برنامج الأمم المتحدة للبيئة • 联合国环境规划署
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT • PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE
ПРОГРАММА ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ ПО ОКРУЖАЮЩЕЙ СРЕДЕ
UNEP

Submission of the United Nations Environment Programme (UNEP) Sustainable Building Initiative (SBCI) to the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA)

24 April 2009

UNEP SBCI proposes that emission reduction in buildings is recognized as an appropriate area for NAMA and that the development of frameworks required to monitor, report and verify such actions are included in a post-2012 Agreement.

A registry of nationally appropriate mitigation action by all developing countries should be established, supported and enabled by developed countries through the provision of the means of implementation (technology, financing and capacity-building) to developing countries in a measurable, reportable and verifiable manner in order to develop policy packages that promote emission reductions in buildings under NAMAs. These policy packages will require the development of indicators and metrics to report on emissions from buildings and to establish national baselines to enable reporting of achieved emission reductions.

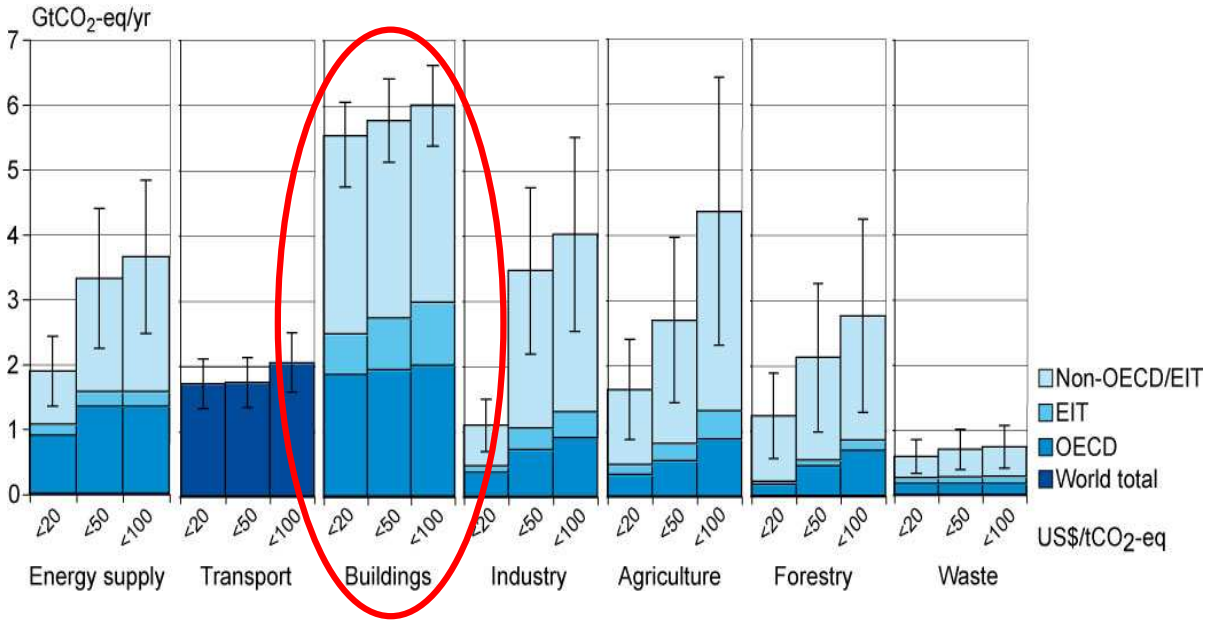
This input is submitted by the Sustainable Building and Construction Initiative (SBCI)[1], a UNEP led partnership between the UN and public and private stakeholders in the building and construction sector which promotes sustainable building practices globally. **This submission expresses the views of UNEP-SBCI on how the potential for emission reduction through energy efficiency improvements in buildings may be realized as part of Nationally Appropriate Mitigation Action (NAMA).**

The Bali Action Plan, paragraph 1, calls for Nationally Appropriate Mitigation Action (NAMA) that is measurable, reportable and verifiable. Greenhouse gas emission reduction in buildings offers an obvious opportunity for developed and developing countries to cooperate in achieving common but differentiated action to realize significant energy efficiency improvements. It should be noted that all emission scenarios and models used in IPCC's fourth assessment report for how to stabilize the concentration of greenhouse gases in the atmosphere at 450 ppm CO2 eqv, assumes a high level of energy efficiency implementation. This is also an area that is particularly appropriate for NAMA, because:

1. **The potential for large emission reductions in buildings exists in all countries**
2. **There are widespread opportunities for country-to-country technology sharing agreements and international capacity building support** as the level of level of implementation of energy efficiency measures in buildings is at different stages in different countries.
3. **Emission reduction from buildings can be relatively easily monitored**, through energy consumption in individual buildings or groups of buildings, converted to greenhouse gas emissions through emission factors. If the metrics used for energy efficiency and emission reduction in buildings can be internationally agreed, the actions undertaken by countries will also be internationally measurable, reportable and verifiable.
4. **The financing need for energy efficiency improvements in buildings can to a large part be offset by reduced energy costs during the life time of buildings** through financial mechanisms as exemplified below. In addition a concerted approach to investments in energy efficient buildings would also support a wider shift towards a low carbon society.
5. **A targeted energy efficiency in buildings effort under NAMA would not only reduce greenhouse gas emissions but would also contribute towards other national sustainable development priorities** including employment generation and upgrading of skills in the existing workforce, provision of more sustainable, affordable and healthy buildings, and improved energy security through reduced overall energy demand. **International technology transfer agreements and support to national capacity building would thereby provide an additional incentive for developing countries to undertake NAMA in this area**

BACKGROUND

The building sector is responsible for more than one third of total energy use and, in most countries, is the largest greenhouse gas emissions source. Energy is mainly consumed during the use stage of buildings, for heating, cooling, ventilation, lighting, appliances, etc. A smaller percentage, normally 10-20%, of the energy consumed is for materials manufacturing, construction and demolition. According to the fourth assessment report (AR-4) of the Intergovernmental Panel on Climate Change (IPCC)[1], building-related GHG emissions was estimated at 8.6 billion metric tons CO2 eqv. in 2004, and could almost double by 2030 to reach 15.6 billion metric tons CO2 eqv. under the high-growth scenario. IPCC's fourth assessment report further concluded that **the building sector not only has the largest potential for significantly reducing greenhouse gas emissions, but also that this potential is relatively independent of the cost per ton of CO2 eqv. achieved. With proven and commercially available technologies, the energy consumption in both new and old buildings can be cut by an estimated 30-50 percent without significantly increasing investment costs.** Energy savings can be achieved through a range of measures including smart design, improved insulation, low-energy appliances, high efficiency ventilation and heating/cooling systems, and conservation behaviour of building users.



IPCC AR-4: Estimated economic mitigation potential by sector and region using technologies and practices expected to be available in 2030. The potentials do not include non-technical options such as lifestyle changes. {WGIII Figure SPM.6}

The above diagram from IPCC AR-4 indicates that the significant potential for energy efficiency improvements and greenhouse gas emission reduction from buildings is common among developed and developing countries, as well as in economies in transition.

---

[1] One of UNEP-SBCI's key objectives is to ensure that Parties to UNFCCC have the information needed to use energy efficiency improvements in buildings as an option for meeting the objectives of the Convention. To further this objective, SBCI, in cooperation with the Finnish research institute VTT, the Central European University in Hungary and the UNEP Risø Centre on Energy, Climate and Sustainable Development in Denmark has conducted research and investigated effects of policies and approaches tested in countries in both the developed and developing world, to reduce greenhouse gas emissions from buildings. The results of this research have been published in three reports; *Buildings and Climate Change- Status, Challenges and Opportunities* (UNEP 2007), *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings* (UNEP 2008), and *The Kyoto protocol, the Clean development Mechanism and the Building and Construction Sector* (UNEP 2008). The main findings and recommendations of these reports are further summarized for this submission. UNEP-SBCI is well placed to facilitate and support the implementation of a number of these recommendations.

In spite of the large potential to reduce energy consumption and greenhouse gas emissions from buildings this potential remains largely untapped. The underlying causes for the poor realization of the emission reduction potential include:

- Fragmentation of the building sector. Buildings normally have a long life cycle with only limited interaction between stakeholders involved in different phases of the buildings lifetime. Furthermore, different aspects of the buildings, each of which contributes to the energy performance of the building, such as architecture, engineering, building management, building function, and occupant behaviour are often poorly or not at all coordinated. There is therefore no natural incentive for stakeholders to cooperate to maximize the overall long-term energy efficiency of the building.
- Split economic interests. The parties typically making decisions about the building design (designers and investors) are seldom the ones who would benefit from energy efficiencyimprovement and its reduced associated costs (owners and users).
- Lack of information and understanding (at all levels) of the importance of the building sector in relation to climate change. Lack of know-how about how to reduce energy use in buildings and about what indicators to use for comparing the relative performance of a building.
- Perceived high business risk and under-estimation of the life-cycle cost benefits from energy efficiency investments in buildings. Lack of track record from real projects, including risk-benefit analyses.
- Energy costs are often a comparatively small part of the overall costs for a building. The economic incentive provided by reduced energy costs is therefore often weak.

EXAMPLES OF SUCCESSFUL POLICY TOOLS FOR EMISSION REDUCTION

A number of countries have however applied different policy tools with the explicit objective to reduce energy consumption and greenhouse gas emissions in buildings. The above referred report *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings* (UNEP 2008), reviewed 80 case studies from 52 countries, comparing 20 types of policy instruments, including regulatory, fiscal, economic, and capacity building measures. **The many policy instruments evaluated in this study can achieve high savings at low or even negative costs (i.e economic savings) for society[2].** Among the policy tools evaluated, regulatory instruments such as building codes were revealed as the most effective and cost-effective category of instruments in this study if enforcement can be secured. A number of regulatory instruments achieved savings in the triple negative digit range of costs. A summary of the findings regarding the emission reduction effectiveness, the cost effectiveness and conditions for use for different policy instruments is provided in table 2.

FINANCING POLICY TOOLS FOR EMISSION REDUCTION

The emission reduction potential in buildings is typically realized through different energy saving measures. This means that **emission reductions in buildings also result in reduced energy use, reduced energy costs and improved energy security**. The payback time for investments in energy saving measures in buildings varies depending on the type and location of the building, as well as on the specific measure applied and local energy costs. However available case studies indicate that the pay-back time for investments in energy efficient buildings resulting in at least 20% reduced energy consumption typically range from 10 to15 years in new buildings and from 15 to 25 years in existing

[2] if the benefits of saved energy and the associated avoided expenses are taken into account in the cost-effectiveness calculations

Table 2. Summary of policy instruments

Policy instruments	Emission Reduction Effectiveness	Cost-effective-ness (a)	Special conditions for success, major strengths and limitations, co-benefits
Appliance standards	High	High	Factors for success: periodical update of standards, independent control, information, communication, education
Building codes	High	Medium	No incentive to improve beyond target. Only effective if enforced
Public leadership programs, incl. procurement regulations	Medium/High	High/Medium	Can be effectively used to demonstrate new technologies and practices. Mandatory programs have higher potential than voluntary ones. Factors for success: ambitious energy efficiency labeling and testing.
Energy efficiency obligations and quotas	High	High	Continuous improvements necessary: new energy efficiency measures, short term incentives to transform markets
Mandatory audit requirement	High, but variable	Medium	Most effective if combined with other measures such as financial incentives
Energy savings performance contracting (EPC)/ESCO support (b)	High	Medium	Strength: no need for public spending or market intervention, co-benefit of improved competitiveness.
Demand-side management programs (DSM)	High	High	Tend to be more cost-effective for the commercial sector than for residences.
Cooperative procurement	High	Medium/High	Combination with standards and labeling, choice of products with technical and market potential
Energy efficiency certificate schemes/white certificates	Medium	High/Medium	No long-term experience. Transaction costs can be high. Institutional structures needed. Profound interactions with existing policies. Benefits for employment.
Kyoto Protocol flexible mechanisms (c)	Low	Low	So far limited number of CDM &JI projects in buildings
Taxation (on CO_2 or fuels)	Low	Low	Effect depends on price elasticity. Revenues can be earmarked for further efficiency. More effective when combined with other tools.
Tax exemptions/ reductions	High	High	If properly structured, stimulate introduction of highly efficient equipment and new buildings.
Public benefit charges	Medium	High	Success factors: independent administration of funds, regular monitoring &feedback, simple &clear design.
Capital subsidies, grants, subsidized loans	High	Low	Positive for low-income households, risk of free-riders, may induce pioneering investments.
Labeling and certification programs	Medium/High	High	Mandatory programs more effective than voluntary ones. Effectiveness can be boosted by combination with other instrument and regular updates.
Voluntary and negotiated agreements	Medium / High	Medium	Can be effective when regulations are difficult to enforce, combined with financial incentives, and threat of regulation
Education and information programs	Low / Medium	Medium/High	More applicable in residential sector than commercial. Success condition: best applied in combination with other measures.
Detailed billing and disclosure programs	Medium	Medium	Success conditions: combination with other measures and periodic evaluation.

(a) Cost-effectiveness is related to specific societal cost per carbon emissions avoided.
(b) Energy service companies (c) Joint Implementation, Clean Development Mechanism, International Emissions Trading (includes the Green Investment Scheme)

buildings. From a societal perspective, where the avoided energy production and transmission costs are factored in, the costs for energy efficient buildings may result in negative costs, i.e. net savings per ton of avoided CO2 eqv.

Construction, renovation, and maintenance of buildings constitute significant economic activities contributing 10 to 40% of countries Gross Domestic Product (GDP) and representing on a global average 10% of country-level employment, 74% of which are in developing countries and 90% of which are with firms of fewer than ten people. The UNEP-ILO report *Green Jobs: Towards decent work in a sustainable low-carbon world* (2008) reports that measures to improve the energy efficiency in buildings lead to direct, indirect, and induced jobs created directly in the real estate and construction sectors.

The difficulty in harnessing these economic benefits lies largely in the same barriers as were mentioned above. In particular three specific barriers are prominent from the economic perspective:

1. Disaggregation of the sector has two direct effects: The economic savings generated through reduced energy use are today not reflected in the property value, which is why investors lack incentives to make additional investments in energy saving features. The building users, who are paying the energy bills, are often not owning the building and are thus unwilling to make investments in energy saving features. The building owners, on the other hand, also lack incentives to make energy saving investments as they do not pay the energy bills.
2. In many countries there are no agreed methodologies or benchmarks to compare the energy efficiency in buildings against. This is not only presenting a problem for investors, but also for national and international policy makers who wish to establish energy efficiency policies for buildings. In the international context, the lack of agreed performance definitions also undermines technology transfer and monitoring/reporting on the performance of building stock.
3. Market forces alone will not be able to bring about emission reductions from buildings, but this requires policy interventions as outlined above. In most countries such policies are still weak or absent.

These factors also contribute to the very low number of CDM projects targeting emission reductions from buildings: Out of 4500 projects in the CDM pipeline only 14 are targeting energy efficiency improvements in buildings (April 2009). UNEP submitted on 6 February 2009 to AWG-KP a proposal for how CDM may be strengthened with regard to projects targeting emission reduction from buildings.

The lessons learned from policies applied to reduce greenhouse gas emissions from buildings, shows that policies, properly adopted to the local context, are not only offering means to achieve significant emission reductions, but also to do this at low costs, and sometimes even at net savings to society. **The challenge is therefore to design mechanisms that will redirect the economic savings associated with emission reduction in buildings so as to offset the increased investment costs for energy emission reduction measures.** This may take the form of two basic models:

1. Establish an investment fund for energy efficiency in buildings. This fund would be used to fund additional initial investment costs for energy efficiency in buildings. Such a fund can be financed through taxations of energy use above the national average or benchmark for that particular building type in the country. In this way the fund would itself also provide additional incentives among high energy users to reduce their energy use. This fund can also be funded by redirecting investments in increased energy production that will be avoided by reduced energy demand in buildings.
2. Establish national regulation that makes energy efficiency investments mandatory in new buildings and in renovation of existing buildings. The additional investment costs will therefore not be optional any longer and will be carried forward from the investment stage to the user stage, in the form of increased building costs. In the user stage, these would in principle be offset by the reduced energy use costs for the building.

The above action requires active intervention of policy makers, as well as defined standards or definitions for energy efficiency in buildings to base the policies on. UNEP SBCI is developing the building blocks for such standards or definitions.