

Buildings, Climate Change and Cities

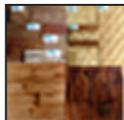
Why buildings and climate change?

The urgency of dealing with buildings in the context climate change comes from two directions. First, buildings are significant consumers of energy throughout their life cycle - from material extraction to dismantling. In fact the IPCC estimates that more than 40% of world energy use is related to buildings. Second, the current rate of urbanization is forcing many countries - especially in the developing world - to engage in large scale housing schemes. The way these houses and cities are built will determine future green-house gas emissions in the building sector



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The Faculty of Architecture and Design at the Catholic University of Guayaquil, Ecuador (UCSG) is exploring the potentials of "eco materials" for low cost housing in Ecuador. And their work focuses on one natural resource that grows abundantly along the Ecuadorian coast: Guadua Angustifolia Kunth - more commonly known as bamboo.

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Buildings will be one of the sectors covered in the report. The building sector is estimated to be worth US\$7.5 trillion (approximately 10% of global GDP) and employs over 111 million people. It is the single largest contributor to man made global greenhouse gas emissions

(GHG) and accounts for one-third of global energy end-use and 60% of the world's electricity consumption. » [More](#)

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More information:

UNEP, Urban Programme, Division of Technology, Industry and Economics, urban.environment@unep.org, www.unep.org/urban_environment

UN-HABITAT, Urban Environmental Planning Branch, Global Division, uepb@unhabitat.org, www.unhabitat.org/sudnet

Credentials:

Articles by: Maike Christiansen, Peter Graham, Robert Kehew, Michelle Malanca, Jorge Morán Ubidia Rosa Edith Rada, Phillip Rhodes

Photos by: iStock, UCSG, UNEP/Still Pictures, UN-HABITAT/Julius Mwelu

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Recent events

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The 'State of Play' of Sustainable Buildings in India



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Upcoming Events

FULL ARTICLES

Buildings, Climate Change and Cities

by Peter Graham, Technical Consultant UNEP Sustainable Buildings & Climate Initiative and Head of Discipline - Architecture & Design, The University of New South Wales, Australia.

The environmental performance of buildings is fundamental to our capacity to adapt to climate change. Urban policy for mitigation of greenhouse gas emissions (GHGs) is however, often not well integrated with policy for climate change adaptation. Reducing energy consumption and associated GHG from buildings not only reduces the potential severity of climate change, but delivers savings, reduces demand for energy generation, creates employment and can improve public health. Such a 'proactive adaptation' approach aims to develop the capacity to change as change occurs: Mitigation should therefore be seen as a key adaptation strategy. This perception could lead to more integrated and effective urban policy.

Proactive Adaptation Challenges

Many developing and transitional economies are planning major increases in energy supply and use in the next 20 years. This is necessary to provide basic energy services to expanding urban populations. An unprecedented boom in new construction is a key driver of this increased demand for energy. In India, for example, programs are underway to bring electricity to more than 400 million people that lack access to basic energy services. Providing such basic services to all will require a three to four-fold increase in primary energy supply and a six to six-fold increase in electricity generation over 2005 capacity by 2030¹. Increases in total energy consumption and associated GHG emissions are almost inevitable.

Unless policy makers mandate strong energy-efficiency performance requirements for buildings, cities may be locked into high levels of energy consumption and associated GHG emissions for decades. Modeling suggests that generating one mega-watt of power costs about four times as much as saving one megawatt through energy-efficiency measures. Failing to commit to energy-efficient building is therefore likely to lead to substantial future economic burdens².

As the urban and global climate changes, the ability for buildings to provide healthy and comfortable environments for their inhabitants will also be challenged. A combination of efficiency (via passive solar design), bio-climatic design (where buildings harmonize with local climatic conditions and people's perceptions of thermal comfort), and design for adaptability (where buildings are designed for simple retrofitting to enhance their resilience to climatic extremes) is important for developing a city's capacity to adapt.

One positive development is that the rate of new construction provides an opportunity to cost-effectively achieve energy efficient and low-emission cities that are resilient and adaptable.

Mitigation Potential

The building sector globally is responsible for up to one third of all energy-related GHG emissions. It is the industrial sector with the greatest potential for delivering cost-effective GHG mitigation using existing knowledge and technologies³. With proven and commercially available technologies, the energy consumption in both new and existing buildings can be cut by an estimated 30 to 80% with potential net profit during the building life-span. Reports from UNEP SBCI show that while the proportion of total national emissions attributable to buildings varies, the mitigation potential is consistently in the region of 30% of base-line emissions or more.

The main source of GHG emissions from buildings is energy consumed during building operations. Building more sustainably means minimizing the energy required for services such as heating, cooling, and lighting⁴.

Urban Policy Priorities

Effective policy for realizing the mitigation potential of buildings requires a combination of mandatory minimum energy performance requirements, economic incentives, capacity building, awareness raising and recognition of leadership⁵. Energy efficiency regulations prove to be the most cost-efficient and effective policy tool for reducing building-related GHGs. However, they are most effective when combined with incentives and voluntary measures⁶. As an example, building-related GHG emissions from urban China are projected to increase by approximately 60% by 2050 under business as usual. Effective implementation of existing energy-efficiency regulations could save about 25% of projected emissions. Combining regulation with incentives and voluntary schemes that promote the delivery of more sustainable buildings may avoid a further 20% of projected emissions⁷.

GHG emissions from the building sector are dispersed and diverse. Mitigation actions must therefore be equally diverse, and relevant to different stakeholders throughout the building process. Suggested strategies include⁸ :

1. Mandatory minimum energy performance standards;
2. Mandatory or voluntary building rating, labeling and certification programs;
3. Loans, subsidies, financial incentives and tax breaks;
4. Building auditing programs for compliance and certification;
5. Mandatory building inventory, survey and monitoring programs, including baseline energy performance by typology and climate region for reporting purposes;
6. Education and certification programs for building professionals;
7. Technology need assessment and sustainable building demonstration programs;
8. Public sector building improvement and high performance building programs;
9. Awareness raising and information campaigns.
10. Inclusion of adaptation & mitigation measures in local development control plans.

Reducing emissions from buildings will bring multiple benefits to both the economy and to society. The construction, renovation, and maintenance of buildings contributes 10 to 40% of countries' Gross Domestic Product, and represents on a global average 10% of country-level employment. If carefully planned, GHG mitigation strategies for buildings can stimulate the growth of new businesses and jobs, as well as contribute to other, equally pressing, development goals, such as better housing and access to clean energy and water. Given these potentials, the mitigation of building-related GHG emissions should be considered as a fundamental element of a city's policies for climate change adaptation. Decision makers should seize the opportunity offered by the climate change crisis to build the foundation for sustainable development today and for the future.

[Click here for more information on the topic and UNEP Sustainable Building and Climate Initiative](#)

[Click here for more information on the topic and UN-HABITAT's Cities and Climate Change Initiative](#)

1. Planning Commission. (2006). Integrated Energy Policy Report of Expert Committee. Government of India, Planning Commission, New Delhi.
2. Hong, W., Chiang, M., Shapiro, R., & Clifford, M. (2007) *Building Energy Efficiency: Why Green Buildings Are Key to Asia's Future* Asia Business Council, Hong Kong.
3. IPCC (2006) 4th Assessment Report
4. UNEP SBCI (2009) *Buildings & Climate Change - A Summary for Decision-Makers* UNEP DTIE, Paris, December.
5. UNEP SBCI (2007) *Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from the Building Sector*, Central European University, September, Budapest
6. UNEP SBCI (2007) Op.Cit.
7. Li, J. (2008) "Towards a low carbon future in China's building sector A review of energy and climate models forecast" in *Energy Policy* 36 1736-1747
8. Cheng, C.C. (2010) "A New NAMA Framework for Dispersed Energy End-Use Sectors" accepted for publication in *Energy Policy* May.

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The Faculty of Architecture and Design at the Catholic University of Guayaquil, Ecuador (UCSG) is exploring the potentials of "eco materials" for low cost housing in Ecuador. And their work focuses on one natural resource that grows abundantly along the Ecuadorian coast: *Guadua Angustifolia Kunth* - more commonly known as bamboo.

Harvested from sustainably managed sources that have an independent certification, bamboo can be processed resource-efficiently - reducing energy consumption, minimizing waste, and reducing greenhouse gas emissions - into a number of different products, such as panels. Depending on the part of the bamboo used (e.g. chopped cane, culms, stem or cane strips), thickness

and orientation of fibers, these panels have different qualities. Thus, they can be used for diverse parts of the building such as flooring, ceiling, exterior and interior walls, doors, furniture or decorative wall covering (see picture). Other eco-material explored by UCSG includes the fire resistant coverings made of processed recycled paper as well as paint based on natural clays.

Eco-materials make affordable building materials for the urban poor. They improve quality of life, have a better cost-benefit relation and their production generates employment. Improving energy efficiency of building materials and therefore the entire building is an important instrument in mitigating greenhouse gas emissions and preserving limited natural resources in the short to mid-term, as well as for adapting to the new conditions brought about by climate change.

For more information on the research project please email ppecomaterials@gmail.com

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Sustainable Building and Climate Initiative (SBCI) which has developed the Common Carbon Metric, a method for demonstrating the ability of buildings - individually and collectively - to meet international carbon reduction targets.

In May UN-Habitat hosted a Conference to Promote Green Building Rating in Africa, in collaboration with the WorldGBC. This event resulted in significant momentum behind the WorldGBC Africa Regional Network and in the birth of three new African GBCs.

In September, the Green Building Council of South Africa will formally launch the Africa Regional Network and host the first ever Africa GBC Day, providing in-depth training for up-and-coming councils in Africa, for example Ghana, Kenya, Nigeria, Egypt and Mauritius.

Africa faces a more urgent need to address social, economic and housing issues than other region. The WorldGBC believes that green buildings and Green Building Councils have a crucial role to play in meeting this need, and that its partnerships with UNEP SBCI and UN-HABITAT are an essential part of its work towards making this goal a reality.

[Click here for more information on the WorldGBC](#)

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Participants at the conference engaged in a spirited debate on whether Africa was ready for green building. Some felt that affordability

considerations severely limited the scope for environmentally friendly design. Others countered by pointing out the savings in operating costs that green buildings can achieve over time. A participant from Tanzania urged his fellow builders to "acknowledge the past and look at our traditions, when our ancestors built green". Progressive builders were glad to learn that they were not alone and that support structures existed to encourage green building. Participating remotely, Jane Henley of the World Green Building Council (WorldGBC) saluted participants: "It is great to be part of so many African nations coming together to find solutions and create opportunities for sustainable building in Africa".

In the end, participants endorsed the WorldGBC model, which allows progressive builders to work together to promote green building practices in their respective countries. Immediately following the conference, participants from several African countries made good on their intentions by formally expressing interest to the WorldGBC, by forming their own Green Building Councils. Conference participants also announced their intention to form an African Network of Green Building Councils. The Conference was supported by UN-Habitat, as part of its Cities and Climate Change Initiative.

[Click here for more information on the Nairobi Declaration on Green Building for Africa and conference materials.](#) For further information email uepb@unhabitat.org.

Green Buildings, Green Economy



The *Green Economy Report*, due February 2011, will make the economic case for green investment in a range of sectors, as well as providing guidance on policies that can be used to catalyze the transition to a green economy.

Buildings will be one of the sectors covered in the report. The building sector is estimated to be worth US\$7.5 trillion (approximately 10% of global GDP) and employs over 111 million people. It is the single largest contributor to man made global greenhouse gas emissions (GHG) and accounts for one-third of global energy end-use and 60% of the world's electricity consumption. Hence the building sector possesses the greatest potential to reduce GHG emissions and achieve greater energy efficiency. This can be accomplished at a lower cost compared to other sectors like power, transport etc.

Green buildings provide benefits beyond environmental benefits. The greening of the building sector can contribute significantly to health and productivity and at the same time lead to a net increase in jobs. This can particularly benefit developing countries, which have an opportunity to lock-in an efficient building stock for decades to come.

Upfront investment costs, long payback periods, conflicts of interest between owner and tenant and a lack of the household ability to pay are just some of the barriers which can hinder the transition to green buildings. Here public policy is of utmost importance. Green building technologies and financing options exist, albeit to a limited extent in many developing countries. To scale up the greening of the sector, design codes and standards enacted by governments are particularly important, supported by incentive schemes such as tax rebates as well as informational campaigns and capacity building programs.

The text is based on draft material prepared for the Green Economy Report, under the coordination of Philip Rhodes, London School of Economics

[Click here for more information on Green Economy or get in contact with Usman.Tariq@unep.org](#)

Recent event

Resilient Cities connect practitioners and researchers



Resilient Cities 2010 was the first global event to provide a platform for exchange and learning about cities and adaptation to climate change. It took place in Bonn, Germany from 28-30 May 2010 and attracted over 500 participants from 53 countries. Running parallel to it, the Mayors Adaptation Forum adopted the Bonn Declaration including 10 action points to confirm the mayors' commitment to globally coordinated local climate action. Additionally, the International Strategy for Disaster Reduction (ISDR) launched the *Making Cities Resilient Campaign* with

aims to guide the process of implementing disaster reduction plans at the city level. UNEP and UN-HABITAT supported the event. The second Resilient Cities Congress is scheduled for 3-5 June 2011.

Follow the links below for more information:

<http://resilient-cities.iclei.org/bonn2010>

<http://www.unisdr.org/english/campaigns/campaign2010-2011/>

<http://resilient-cities.iclei.org/bonn2010/mayors-adaptation-forum/>

Shanghai Expo Forum - On the way to a low-carbon urban future



The Theme Forum *Towards a Low-Carbon City: Environmental Protection and Urban Responsibilities* took place in Nanjing, China from 3-4 July 2010.

Relating to the overall Shanghai Expo theme *Better City, Better Life*, this fourth Forum discussed how to integrate environmental responsibility across all sectors such as urban planning, energy use and industry development to foster a resource-efficient lifestyle, avoid and minimize environmental risks while maintaining economic growth and social wellbeing. The event, co-

organized by UNEP, attracted over 700 participants. The Forum outcomes will feed into the *Shanghai Declaration* to be launched during the Summit Forum on 31 October 2010. UN-HABITAT co-organizes the Theme Forum *Harmonious City and Liveable Life* to be held 4-7 October in Hangzhou.

[Click here for more information](#)

WE NEED YOU: UNEP survey on instruments for better environmental planning in cities

Many urban development issues are directly linked to the environment. Environmental degradation limits the contribution of cities to development. UNEP, supported by Cities Alliance, is developing a methodology to support cities in better integrating the environmental dimension in their long-term strategic planning. The methodology will be accompanied by a set of instruments and approaches. UNEP is inviting decision-makers and urban practitioners from all cities and local authorities, particularly from developing countries, to share their experiences on which instruments have worked in their cities and why. This information, which is being collected via an on-line survey, is crucial for ensuring the methodology responds to the needs of urban environmental planners and provides decision-makers with useful instruments. Through contributing to the survey you can make sure that the methodology reflects your experience and will be relevant for your city or your organization.

[Click here to take the survey](#)

New Publications

Sustainable Urban Energy Planning: a handbook for cities and towns in developing countries



This handbook jointly prepared by ICLEI, UN-HABITAT and UNEP explains the importance of urban centers in developing countries engaging in sustainable energy planning. It provides a step-by-step process for developing plans and detailed guidance on how to implement it.

[Click here to download the report](#)

Common Carbon Metric & Protocol: a universal method of measuring a building's carbon footprint



A *Common Carbon Metric & Protocol* (CCM) allows emissions from buildings around the world to be assessed and compared consistently, and improvements measured to support policy development and industry initiatives at all levels. [Click here to download the report](#)

Buildings and Climate Change: a Summary for Decision-Makers



The *Summary for Decision-Makers* highlights the potential of more efficient buildings in addressing climate change. The report argues that the building sector has the highest potential of all to deliver greenhouse gas emissions cuts, at the least cost, using available and mature technologies.

[Click here to download the report](#)

UNEP SBCI commissioned a report series to quantify the influence of buildings on climate change in selected regions. Reports on India, Mexico and South Africa are available:

Greenhouse Gas Emission Baselines and Reduction Potentials from Buildings in South Africa



This report investigates policy initiatives in South Africa to achieve greater energy efficiency and reductions of greenhouse gas emissions. Importantly, the need for action to address climate change and energy efficiency is well recognized in the public and corporate sectors. There are many examples at both the national and local levels where the public sector is demonstrating leadership. [Click here to download the report](#)

The 'State of Play' of Sustainable Buildings in India



This report provides representative examples of the range of sustainable building activity in India by giving an overview of the state of sustainable buildings and construction in India, including current best practice, recent successes and recommendations for further mitigation of climate change impacts. [Click here to download the report](#) Safer Production, Programme Officer

Greenhouse Gas Emission Baselines and Reduction Potentials from Buildings in Mexico



This report represents the first comprehensive description of the factors that determine the present and future contribution of residential and commercial buildings in Mexico to climate change including best practice, successes, barriers and recommendations for further implementation towards mitigation of climate change impacts. [Click here to download the report](#)

Upcoming Events

46th ISOCARP Congress, Sustainable City - 19-23 Sep 2010, Nairobi, Kenya - [Click here for more information on the congress](#)

C40 conference: Deltas in Times of Climate Change Conference - 29 Sep -1 Oct 2010, Rotterdam, The Netherlands - [Click here for more information on the conference](#)

Business for the Environment-B4E - 4-5 Oct, Mexico City, Mexico - [Click here for more information on the conference](#)

World Habitat Day "Better City, Better Life" - 5 Oct 2010, Shanghai, China- [Click here for more information on the World Habitat Day](#)

The Future of Cities Congress - ICLEI 20th Anniversary - 5-7 Oct 2010, Incheon, Korea - [Click here for more information on the congress](#)

Convention on Biological Diversity (CBD) COP10 - 18-29 Oct 2010, Nagoya, Japan - [Click here for more information on the COP10](#)

UNEP-SBCI Symposium: Sustainable Buildings Policies and Practices in Developing Countries - 29-30 Oct, Shanghai, China - [Click here for more information on the Symposium](#)

UNFCCC COP16 - 29 Nov-10 Dec, Cancun, Mexico - [Click here for more information on COP16](#)