Case Study

Framework for the Development of Green Buildings Strategy for Karachi

Pakistan

July 2012

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Quick facts	
Zone	Karachi, Sindh province
Timeframe	2012-2014
Topic	Green building, Sustainable infrastructure

Introduction

Karachi is the largest city of Pakistan, with an estimated population of over 18 million. The city is located in the south of the country, along the coastline of the Arabian Sea. A mega-city, it is spread in an area of over 3,527 sq km, and is experiencing large-scale development in sectors, particularly the building sector. Increased construction activities includes commercial buildings and large "mini-cities" at the periphery. All development projects, including both those currently in progress and already completed ones, were built conventionally and without consideration of aspects of green building. This has resulted in a massive demand for electricity, water and gas, and thereby shortages in all three types of utilities.

Rationale

Despite the fact that, on average, people spend 22 hours a day indoors, no attention is paid to ensure that the buildings do not generate pollution and are environmentally friendly.

According to a Worldwatch publication, buildings are responsible for 40 per cent of the world's total energy use; 30 per cent of raw material con-

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sumption; 25% of timber harvesting; 35% of the world's carbon dioxide emissions; 16 per cent of freshwater use, 40% of generated municipal solid waste destined for local landfills; and 50% of ozone-depleting chlorofluorocarbons (CFCs) still in use. Buildings can also affect watersheds, habitats, air quality, and significantly add to traffic congestion.

A United Nations Environment Programme (UNEP) report states that if the current practices of construction do not change, expansion of the built environment will destroy or disturb natural habitat and wildlife on 70% of the earth's land surface by 2032.

Green building is the practice of creating building structures that aim to reduce energy consumption, increase the use of renewable energy, minimize production of waste, and maximize occupants' health and comfort. It represents a holistic and multidimensional approach to design, including aspects like material assessment, construction processes and their impact on the environment, transportation, indoor pollution, and the disposal of waste.

Like any other project, buildings and their constructions have major environmental impacts. These include raw material extraction and consumption, energy use, air pollution (emission of greenhouse gases), dust emissions during construction, indoor pollution, noise pollution, use of water, solid waste and water generation, land-use modification, site clearance, aesthetic degradation, health risks for construction workers and building occupants, and impacts of transportation of building materials to site (truck-related vehicle emissions; increased traffic and, the impacts on road traffic).

Benefits

Green buildings are also called sustainable buildings, eco-buildings, high-performance buildings and environment-friendly buildings.

Green buildings have a marked edge over conventional buildings in that they save electricity and conserve potable water, which is achieved through a number of measures. Photovoltaic (PV) panels, which convert sunlight into electricity, can provide for over 20% of a building's electricity demand. If the building has a large sunlight-exposed surface area (ie. large bungalows, factories, community halls) where more PV panels can be installed, PV could meet over 50% of the building's electricity demand.

Energy savers and sensors (devices that automatically turn off the lights when a room is unoccupied) can together reduce electricity consumption by nearly 20%. Wind turbines convert wind energy into electricity, and can provide for 10 per cent of the building's electricity demand. In Karachi, with its high winds in the areas along the coastline, these devices can provide for over 40% of the electricity demand of a building.

Insulation and rooftops painted in light colors, coupled with trees and other greenery, can keep rooms cool, thereby cutting down on the electricity used by air conditioners, and thermostats can be set at lower levels. Together this can save about 10% of electricity.

Cutting energy consumption has other advantages too. Air pollutants such as nitrogen oxides, particulates, sulphur dioxide and carbon dioxide are produced by the burning of fossil fuels. Nitrogen oxides are a component of smog which causes respiratory illness and also contribute to smog. Sulphur dioxide causes acid rain and carbon dioxide is a major greenhouse gas and is implicated in climate change.

According to recent estimates, an average-sized green building can contribute to the following annual emission reductions: 1,200 pounds of nitrogen oxides, 150 pounds of particulate matter, 1,300 pounds of sulphur dioxide, and 585,000 pounds of carbon dioxide.

Green buildings can also entail significant water savings. Water conservation strategies in green buildings are wide-ranging and can save potable water by as much as 40%. Some of these strategies

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include the use of low-flush toilets (with 5-liter tanks as opposed to the current 11 liters); shower heads with flow regulators that reduce water pressure; faucet aerators (water from taps passes through a gauze, causing air to enter the water and thereby reducing the volume of water delivered); spring taps; ban on the use of hosepipes connected to water pumps for washing cars; control of water overflows from overhead tanks; recycling of water and its use in industries; use of grey water or sullage (water from kitchens, bathrooms and washing machines) for washing and gardening; leak control; and rainwater harvesting.

The options green buildings use for waste reduction are manifold and include aspects like: reuse and minimization of building debris; use of building materials that are more durable and easier to repair; designs that generate less scrap material through dimensional planning; use of reclaimed building materials; development of indoor recycling programs; and designs for deconstruction. Combined, these strategies can have a dramatic impact on waste reduction. Waste reduction rates in green buildings can range from 50 to 75%.

Green buildings stress indoor environmental quality since people spend 90% of their time indoors. The building occupant's health, comfort and productivity are largely dependent on the indoor environment. Four attributes are associated with green building design: ventilation, temperature, lighting control, and day-lighting. Proper design and consideration lead to the following benefits: low-emitting sealants, adhesives, paints, carpets and composite wood; indoor chemical and pollutant source control; better lighting quality; more day-lighting in buildings; reduced health problems (respiratory illness, allergies, asthma, sick building syndrome) and the occupant's control over temperature, light and glare.

Policy Barriers

The Government's agenda on environmental issues is almost non-existent. The current mind-set concentrates on development without any strategic benchmark on protecting the environment. Large-scale awareness programs are required to sensitize decision-makers and politicians.

Way Forward

The local building control authority needs to develop a policy framework which should pave the way for the development of green buildings regulations, which should aim at reducing environmental impacts of buildings and keeping urban environments clean and liveable. The framework should target resource efficiency, waste reduction, human risks, environmental risks and environmental pollution prevention.

Timeline

2012 – Development of strategic policy and regulations
2013 – Sensitization of decision-makers and public; holding of workshops
2014 – Enforcing the green building policy framework and regulations

Conclusions

While there would be about two per cent increase in construction costs of green buildings, the operation and maintenance costs would be reduced by 20%. Minimal increases in upfront costs of about two per cent to support green design would, on average, result in lifecycle savings of 20% of total construction costs - which is more than 10 times the initial investment.

References

Molly O'Meara (1999), Reinventing Cities for Peopleand the Planet, Worldwatch Paper 147, Worldwatch Institute, Washington, DC;

Brown, L.R., et al, (1998), Beyond Malthus:Sixteen Dimensions ofthe Population Problem, Worldwatch Institute, Washington, DC;

UNEP (2007), Buildings and Climate Change, Status, Challenges andOpportunities, Nairobi;

UNEP-IE (2003), Sustainable Building and Construction: Facts and Figures, Nairobi;

Rethinking Our Built Environments: Towards a Sustainable Future, 2009, Ministry for the Environment, New Zealand Government, Wellington.