Integrating Environmental Sustainability and Disaster Resilience in Building Codes

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This document aims to provide an overview of the current status of building code formulation and enforcement in selected countries in Asia, with a focus on environmental sustainability and disaster resilience.

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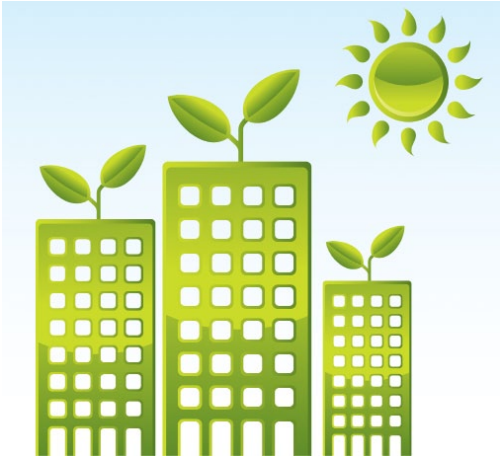
Annexes to this publication, including country reports and detailed good practice documentations, can be downloaded from http://www.unescap.org/esd/suds/building-codes/index.asp

Executive Summary



Buildings constructed today are likely to dictate city and town development and consumption patterns for decades to come. Buildings consume more energy than any other sector. Moreover, they play an important role in protecting people from natural and manmade hazards. Therefore, buildings are one of the logical points to start building sustainable cities: cities that are resilient, environmentally sound, economically productive and socially inclusive.

The planning, design, construction and operation of buildings are governed by building codes. These contain regulations that specify what type of materials and techniques one is allowed to use when designing and constructing a building. Not all countries in Asia and the Pacific have a building code, and countries that do have a code often struggle with low compliance rates. Improving building code quality and enforcement could help cities improve their environmental sustainability and disaster resilience.

To address this issue, the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) and the Asian Institute of Technology (AIT) have established a partnership. The aim of this partnership was to gain an overview of the current status of integration of disaster resilience and environmental sustainability in building codes in the Asia-Pacific region and to document a series of good practices, showing a range of incentives for building code stakeholders in this region to further integrate these elements in their work. The draft output of this research were discussed during an Expert Group Meeting, held in Bangkok, Thailand on 26 and 27 April 2012.

The meeting was attended by government officials from Singapore, Myanmar, Nepal and Thailand as well as researchers and experts from Japan, India, Pakistan, the Republic of Korea and Thailand. The main objective of the meeting was to discuss how the requirements for designing disaster resilient and environmentally friendly buildings can be incorporated into building codes. During the meeting, several key strategies were suggested to overcome issues related to formulation and enforcement of building codes. This publication summarizes the main conclusions of the research and of the discussions held at the Expert Group Meeting.

The research on building code formulation comprised an analysis of nine building codes within and outside the Asia-Pacific region. Four reference countries were selected: USA (California), Singapore, Australia and the United Kingdom. The building codes of these countries/regions were analyzed for lessons to be learned for Asia and the Pacific. The five target countries that were selected are Thailand, India, Bangladesh, the Philippines and Sri Lanka.

All building codes were analyzed for six elements of environmental sustainability (material conservation; energy conservation; water conservation; soil/land conservation; solid waste reduction; air pollution control) and six elements of disaster resilience (wind loads; snow loads; seismic effects; rain/flood resistance; wildfire; landslide resistance).

With regards to environmental sustainability, this report finds that this is a relatively new element in Asian building codes and is therefore not well integrated. Out of all the target countries, India is the only country that has addressed all six elements of environmental sustainability. However, most of the building code is voluntary and the parts that are mandatory are usually not complied with much.

The main conclusion with regards to disaster resilience is that some hazards have been addressed reasonably well. Resistance against storms and typhoons, for example, has been integrated in all codes analyzed – in most countries in mandatory prescriptions, in Sri Lanka in voluntary guidelines. The detailed analyses of the separate countries can be downloaded from http://www.unescap.org/esd/suds/building-codes/index.asp. The way building codes are enforced differs from country to country and heavily depends on the context in which the practice operates. In some cases, awareness raising and keeping the rules as simple as possible is of utmost importance (e.g. Viet Nam, Nepal), while countries that can depend upon a strong government regulatory system have experimented with fiscal (Japan), financial (India) and zoning (Republic of Korea) incentives. Singapore has combined these success factors into one comprehensive masterplan. In China, a lack of capacity with local staff has led the national government to transfer responsibility for compliance checking from the local governments to accredited private sector companies that can certify compliance.

The variety in the approaches shows that it is possible to improve environmental sustainability and disaster resilience of the built environment even in least developed countries. The main challenge is to find incentives that work in a specific context. Factors to take into account include financing, human capacity, enforcement capacity and stakeholder cooperation. Detailed documentation of the seven good practices can be downloaded from http://www.unescap.org/esd/suds/building-codes/index.asp

Given this context, the main challenges with regards to building code formulation and enforcement are similar. For both, political will is of utmost importance. Without political backing, it will be very difficult to overcome other challenges, such as lack of funding and lack of coordination between stakeholders. To organize political backing, awareness raising, especially in the aftermath of disasters, could be an effective strategy. Another way to do this would be to show the financial and political costs of not taking action.

Within the scope of this project, there was not enough time to examine all the separate codes, and focus was laid on the main ones that are most often used. Therefore, the project may not cover all prescriptions pertaining to environmental sustainability and disaster resilience.

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Chapter 1:
INTRODUCTION

1.1 Context

Buildings constructed today are likely to dictate city and town development and consumption patterns for the next 20 to 30 years. The way we design, build and maintain our buildings will influence the sustainability of a city and the health and safety of its inhabitants for decades to come. A lot of problems cities are coping with, can be addressed by formulating appropriate building codes and enforcing them. Disaster resilience, energy efficiency and prevention of diseases are all issues that are influenced by building codes.

Resilience to earthquakes, for example, is very much linked to design and construction. In earthquakes of approximately the same magnitude, 2 people died in California (USA, 2003), while 41,000 people lost their lives in Bam (Iran, 2004). Experts agree that most of this difference is attributable to the high standards of earthquake safety that California sets in its building code. In other words, many lives could have been saved by implementing and enforcing better building codes. The same is true for extreme weather events like cyclones and hurricanes, which are likely to occur more often with climate change; much of the destruction this will cause can be prevented by constructing safer buildings.

For environmental issues, buildings are extremely important. Buildings consume energy in all phases of their lifecycle. Designing and constructing buildings that use resources efficiently is one of the best ways to address sustainability in a city. By incorporating disaster resilience and environmental sustainability in building codes, buildings in the future can be more people and environment friendly. This will decrease the carbon-footprint of cities and their impact on the environment, while increasing people's quality of life.

In many Asia-Pacific countries, building codes do not take into account environmental issues. Some countries don't have a building code, or have codes with very low compliance rates. Many problems in cities could be addressed by helping countries in the Asia-Pacific region to incorporate these concerns in building codes and by identifying approaches that would increase compliance.

1.2 The Project

The overall objective of the project 'Incorporating Environmental Sustainability and Disaster Resilience in Building Codes' is to integrate elements of environmental sustainability and disaster resilience both vertically (across government levels) and horizontally (across construction sectors) in codes that govern planning, design and construction of buildings in urban areas. Another objective is to gain an overview of current integration of disaster resilience and environmental design in building codes and building code compliance in the Asia-Pacific region, and to determine incentives for stakeholders in this region to further integrate these elements in their work.

Three main activities were undertaken under this project:

1. A report comprising analysis of the integration of disaster resilience and environmental design in building codes was prepared. For this report, building codes of nine countries were evaluated. This report mainly focuses on building code formulation.
2. A report documenting seven good practices of incentives for green and resilient buildings was prepared. This report mainly focuses on building code enforcement.

3. An Expert Group Meeting was organized on 26 and 27 April 2012 in Bangkok, Thailand. The meeting discussed draft versions of the two above-mentioned reports and made recommendation for next steps. The meeting was attended by government officials from Singapore, Myanmar, Nepal and Thailand as well as researchers and experts from Japan, India, Pakistan, the Republic of Korea and Thailand.

This document synthesizes the output of these three processes.