



Integrating Environmental Sustainability into the Building Codes: *Lessons from Asia-Pacific Region*

Based on the outcomes of the Project “Integrating Sustainability and Disaster Resilience in Building Codes” implemented by Sustainable Urban Development Unit of ESCAP

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Project “Integrating Sustainability and Disaster Resilience in Building Codes”

Overall objective:

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.

Objective:

Gain an overview of current integration of disaster resilience and environmental design in building codes and building code compliance in the AP region, and to determine incentives for stakeholders in this region to further integrate these elements in their work

Description:

- Implemented by ESCAP and Asian Institute of Technology
- Focuses on building code formulation and enforcement
- Evaluates building codes of 9 countries (only the main codes) and illustrates 7 good practices of incentives

Integration of sustainability in building codes in AP: Analytical framework

Based upon the research by ESCAP and AIT, all building codes were analyzed for 6 elements of environmental sustainability.

Environmental Sustainability	USA	Singapore	Australia	UK	Thailand	India	Bangladesh	Philippines	Sri Lanka
Material conservation & Resource efficiency	●	●	●	●	●	●	●	●	●
Energy conservation & Efficiency	●	●	●	●	●	●	updating	voluntary	updating
Water conservation	●	●	●	●	●	●	updating	●	●
Land and soil conservation	●	●	●	●	●	●	●	●	●
Solid waste reduction	●	●	●	●	●	●	●	●	●
Air pollution control	●	●	●	●	●	●	●	●	●

Figure 2: Integration of Environmental Sustainability in Building Codes and Regulations. Green means integrated, red means not integrated.

Developing Asia-Pacific: Context and trends

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- Currently 1.6 billion people or 40% of population in Asia live in urban areas. It is estimated that by 2030, a majority or 2.7 billion people will live in cities and towns - equivalent to adding a new town of 137,000 people every day for the next 21 years!
 - Cities account for 75 % of all energy use in AP and for 80% of all greenhouse gases emissions
 - **Buildings sector** is one of the most energy consuming and one of the fastest growing in AP
 - Some countries introduced building codes only recently
 - Lack of capacity to enforce and lack of tradition to comply
 - **Sustainability** is a relatively new concept to include into building codes
 - Lack of understanding of its relevance and multiple benefits
 - Lack of motivation to invest on the part of builders and building owners, especially if no incentive mechanisms are in place to offset additional cost
 - Lack of framework and capacity to evaluate construction and retrofit projects and to ensure enforcement
 - **Energy efficiency** is one of better covered sustainability components, but often not in a comprehensive enough manner

Project Case Studies

Nepal: Four building codes for four types of buildings	<ul style="list-style-type: none">▪ <i>4 levels of building code sophistication in a context of almost strictly non-engineered buildings</i>▪ <i>Involvement of all stakeholders for best results</i>
Republic of Korea: Building Design Criteria for Energy Saving	<ul style="list-style-type: none">▪ <i>Combination of prescriptive and performance-based options with freedom to choose and innovate</i>▪ <i>Using non-financial incentives to improve energy efficiency</i>
Singapore: Green Building Master Plan	<ul style="list-style-type: none">▪ <i>Long-term vision and ambitious goal with strong government lead</i>▪ <i>Involvement of all stakeholders and various policy instruments</i>
India: Energy Efficient Housing Scheme	<ul style="list-style-type: none">▪ <i>Making financing of housing dependent on energy savings in construction projects</i>▪ <i>Choosing the target group with highest energy efficiency potential</i>
Japan: Long-life Quality Housing	<ul style="list-style-type: none">▪ <i>Comprehensive approach to improving housing quality</i>▪ <i>Using fiscal and financial incentives to encourage people to buy higher quality new housing</i>
China: Construction Supervision System	<ul style="list-style-type: none">▪ <i>Responsibility for compliance checking transferred from public to private sector</i>
Viet Nam: Preventing Typhoon Damage to Housing	<ul style="list-style-type: none">▪ <i>Technical guidelines combined with awareness raising, training of technician and authorities, and affordable housing loans</i>

Good Practice: Nepal - Keep it simple

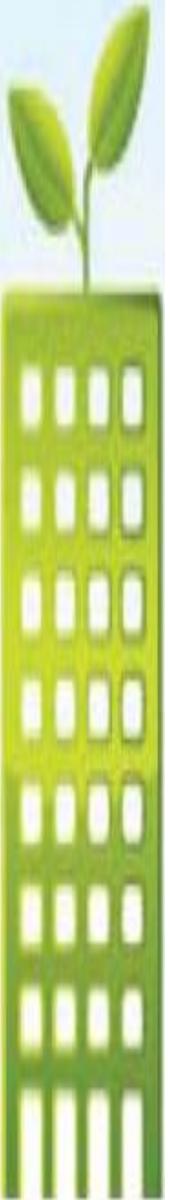
Context

- 80-90% of buildings are build without involvement of an engineer. 40% of these are build by home owners, often after consultation with a local craftsman
- Local builders lack technical knowledge of safe construction techniques
- Local authorities have low budgets and lack expertise and knowledge to assess construction projects
- Engineered buildings are more expensive to construct than those build without an engineer

What did they do at the national level

- First building code (2003) contained 4 levels depending of the building type - the simpler the design, the simpler the rules. It included the rules for non-engineered urban and rural buildings.
 - Easier to understand and to comply with for all stakeholders
 - Easier to check for local authorities
 - Cheaper to implement

But Nepal does not have a strong tradition of building code enforcement.



Good Practice: Nepal - Involve all Stakeholders

What did they do at municipal level in the city of Dharan

- Trainings were given to masons and local builders who formed a professional association
- Licensing system was introduced for builders (4 days training) resulting in improved expertise and in peer pressure
- Set five simple rules that all construction should follow and informed the rules to all stakeholders involved
- Reward and punishment system for builders and homeowners was introduced
- Orientation for new homeowners + Construction permit system that involves homeowners into every step of the construction process

Result: compliance has risen quickly from “nothing to something”

Key elements that played critical role

- Good understanding of the local context and addressing it
- Well established network of stakeholders at the local level and involvement of homeowners
- Local builders were given the same central role in building code implementation as they have in building process
- Active engagement of all stakeholders allowed to keep the costs low for the local authorities



Good practice: Republic of Korea

Turn local context into incentive

Context

- Buildings account for 25% of total energy consumption
- With estimated 13 million houses in 2008 an average 500,000 dwellings are added yearly
- Although energy efficiency has been a priority since 1970, until 2004 there was no formal energy standard for new or existing buildings
- There are strict zoning restrictions (building size, height, etc) due to the scarcity and value of available land

What did they do

- Adopted Building Design Criteria for Energy Saving that lists mandatory and voluntary measures under three categories: architectural design, mechanical design and electric facility design. Points are assigned to these measures depending of level of achievable EE improvement
- To get construction permit one has to prove that at least 60 points are implemented.
- If measures exceed the 60 point threshold, zoning incentives are applied
 - 70-80 points - 2% in building size increase over local zoning regulations
 - 80-90 points - 4% increase
 - 90-100 points - 6% increase



Good practice: Republic of Korea

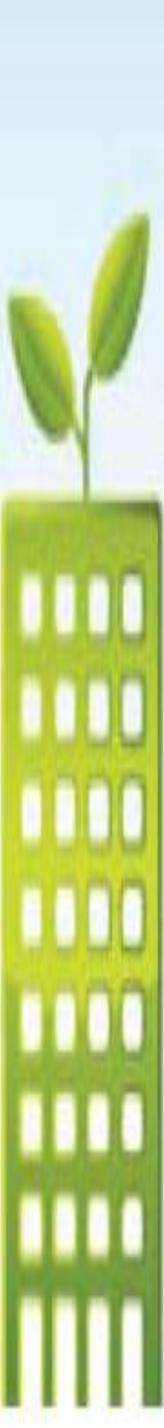
Turn local context into incentive

How did they do it

- Application has to be signed by licensed architect, mechanical engineer and electrical engineer before relevant office can issue construction permit
- If local authority lacks expertise, Korean Energy Management Company can be asked to do assessment
- System to review buildings during or after construction and to revoke permit in case of non-compliance

Key elements that played critical role and benefits

- Relaxation of zoning restrictions allows to generate extra income that can outweigh extra investment by developer
- Incorporation of such strong non-financial incentive allows to improve energy efficiency without much extra investment both from the government and the developer
- Voluntary selective measures allow developer to choose those that are most suitable and profitable
- To encourage innovation and to ease adoption in the market, new more efficient technologies would be included as selective measures and receive more points (as rated by certified laboratories)



Lessons from Asia-Pacific Region: Project recommendations

- When enforcement levels are low, Asian developing countries should start with improving building code enforcement before incorporating all the different elements of environmental sustainability and disaster resilience
- There should be different types and levels of sophistication in codes depending of size and typology of buildings
- With regards to environmental aspects, it may be better to have codes that are performance based
- In more sophisticated codes, it may be better to have design guidelines specifying which environmental codes to use, instead of trying to integrate all environmental aspects into one general building code
- Building codes should be readily available and affordable
- Organizations to support local government and to enforce building codes should be set up at the national level
- To improve relevance of building codes to the local situation, more lab testing facilities should be created.



Thank you!

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