



# **BUILDING REGULATION FOR RESILIENCE**

Managing Risks for Safer Cities



**WORLD BANK GROUP**



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# Foreword

Poor populations are disproportionately harmed by major natural disasters, such as floods and landslides, as well as recurring smaller-scale events like fires and spontaneous collapse. The unregulated settlements where they often live are in areas prone to such hazards, and their informally constructed houses tend to be highly vulnerable to climate and disaster risk.

Building and land use regulation has proven a remarkably powerful tool for increasing people's safety and resilience and limiting the risk that they face, including both the risk of large, rapid-onset events such as earthquakes or cyclones, and the risk of more contained but still deadly events such as fire or spontaneous building collapse.

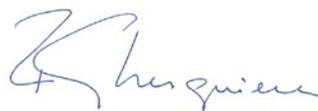
For low- and middle-income countries, however, this tool has proved elusive. These countries lack the mature regulatory regimes that are sustained by a regulatory "ecology" of supporting institutions. Nor have they much benefited from knowledge transfer or compliance assistance of functional regulatory regimes. Simple transfer of documents from mature regulatory systems—without specific adaptation to local cultural, economic, and political factors affecting compliance—has led to a critical "implementation gap."

Part of the challenge for low- and middle-income countries is the pace of urbanization. These countries will experience a doubling of their building stocks in the next 15 to 20 years. It is crucial that this new construction helps to lower risk and does not recreate or expand existing vulnerability. While safer, code-compliant construction may add to initial construction costs,

these investments can be balanced against the reduced loss of life and property in future disasters. Producing safe and resilient cities, communities, and homes must be the priority.

*Building Regulation for Resilience* presents key lessons, experiences, and challenges to progress in building regulatory capacity for disaster risk reduction, and includes illuminating case studies of successes and failures. It sets forth practical measures, grouped into seven major priorities, to create a new momentum for bridging the implementation gap. Under the proposed agenda, the international community has an opportunity to leverage regulatory governance as a means of proactively protecting populations, avoiding disasters, and encouraging sustainable and resilient urban development.

Now is the right time to build on this momentum. With the adoption of the *Sendai Framework for Disaster Risk Reduction*, there is a clear international consensus recognizing the importance of building codes and standards. Going forward, improved building regulatory capacity must be part of the effort to reduce risk among the most vulnerable and ensure shared prosperity.



Francis Ghesquiere

Global Facility for Disaster Reduction & Recovery  
April 2016

# Acronyms / Abbreviations

<b>AIA</b>	American Institute of Architects	<b>ICC</b>	International Code Council
<b>BCA</b>	Building Consent Authority	<b>ICT</b>	information and communication technology
<b>BCC</b>	Building Code Commission	<b>IFC</b>	International Finance Corporation
<b>BCEGS</b>	Building Code Effectiveness Grading Schedule	<b>ISMEP</b>	Istanbul Seismic Risk Mitigation and Emergency Preparedness Project
<b>BEEPS</b>	Business Environment and Enterprise Performance Survey	<b>ISO</b>	Insurance Services Office
<b>CAPRA</b>	Probabilistic Risk Assessment program	<b>JICA</b>	Japan International Cooperation Agency
<b>CBO</b>	community-based organization	<b>JNBC</b>	Jamaican National Building Code
<b>CENEPRED</b>	National Center for Estimation, Prevention and Reduction of Disaster Risk	<b>KEBS</b>	Kenya Bureau of Standards
<b>CETEC</b>	Centro Tecnológico del Cemento y Concreto	<b>MCC</b>	Mennonite Central Committee
<b>CTIF</b>	International Association of Fire and Rescue Services	<b>NBC</b>	Nepal Building Code
<b>DRR</b>	disaster risk reduction	<b>NEC</b>	National Ethics Council
<b>EERI</b>	Earthquake Engineering Research Institute	<b>NEHRP</b>	National Earthquake Hazards Reduction Program
<b>FEMA</b>	Federal Emergency Management Agency	<b>NGO</b>	nongovernmental organization
<b>FID</b>	Fund of Intervention for Development	<b>NSET</b>	Nepal Society for Earthquake Technology
<b>FIMA</b>	Federal Insurance and Mitigation Administration	<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>GDP</b>	gross domestic product	<b>OGA</b>	Guatemalan Accreditation Body
<b>GEM</b>	Global Earthquake Model	<b>RFPE</b>	regulatory flood protection elevation
<b>GFDRR</b>	Global Facility for Disaster Reduction and Recovery	<b>RVS</b>	rapid visual screening
<b>GIS</b>	geographic information system	<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>HFA</b>	Hyogo Framework for Action	<b>UNIDNDR</b>	United Nations International Decade for Disaster Reduction
<b>HFA2</b>	Hyogo Framework for Action 2	<b>UNISDR</b>	United Nations International Strategy for Disaster Risk Reduction
<b>HMF</b>	housing microfinance	<b>USAID</b>	U.S. Agency for International Development
<b>IANZ</b>	International Accreditation New Zealand	<b>USGS</b>	U.S. Geological Survey
<b>IAS</b>	International Accreditation Service		
<b>IBC</b>	International Building Code		
<b>IBHS</b>	Insurance Institute for Business Home Safety		

*All figures are in US\$ unless otherwise stated.*

# Executive Summary

## Mobilizing building code regulations for risk reduction

In the past 20 years, natural disasters have affected 4.4 billion people, claimed 1.3 million lives, and caused \$2 trillion in economic losses.<sup>1</sup>

Exceptional disaster events, along with chronic events such as individual building collapse and fires, disproportionately impact the poor and the marginalized. In the last 30 years, over 80 percent<sup>2</sup> of the total life years lost in disasters came from low- and middle-income countries, typically setting back national economies by 5 to 120 percent of gross domestic product (GDP). There is evidence that disasters' impact on GDP is 20 times higher in developing countries than in industrial nations. These impacts pose a major threat to the World Bank Group's goals of eradicating poverty and boosting shared prosperity.

As the scale, frequency, and severity of natural hazards continue to rise, so will future expected losses in the built environment. The annual losses resulting from disasters such as earthquakes, tsunamis, cyclones, and flooding are expected to increase from roughly \$300 billion to \$415 billion by 2030.<sup>3</sup>

The international community has made significant progress in strengthening disaster preparedness, response, and early warning systems. However, it has been less successful in effectively mitigating underlying risks in the pre-disaster context, especially in low- and middle-income countries.

Nor has it been successful in addressing chronic risk—indeed, governments rarely even record events such as building collapse and fires, let alone cover the loss.

Building code implementation has a crucial role to play in disaster risk reduction (DRR), one that until recently has not received adequate attention. This report focuses on how building regulation can be enhanced to save lives and reduce destruction from both disasters and chronic risks. Notably, it supports a shift in focus from managing disasters to reducing underlying risks.

Successful mechanisms of risk reduction and hazard adaptation in developed countries have relied in large part on effective and efficient building regulatory systems, which have been incrementally improved over time. In the past 10 years, high-income countries with more advanced building code systems experienced 47 percent of disasters globally, yet accounted for only 7 percent of disaster fatalities.<sup>4</sup>

A comparison between the 2003 earthquakes in Paso Robles, California, and Bam, Iran, further illustrates this pattern. The earthquakes had similar magnitudes and struck within three days of each other. However, the death toll was two in Paso Robles as opposed to more than 40,000—nearly half the city's population—in Bam.<sup>5</sup>

## Sendai Framework for Disaster Risk Reduction 2015-2030

In March 2015, the Third UN World Conference on Disaster Risk Reduction adopted the *Sendai Framework for Disaster Risk Reduction 2015-2030*, making it the first major agreement of the post-2015 development agenda. The priorities of the *Sendai Framework for Action* have ample references to building and land use regulatory development, and they consider implementation to be a key element of disaster risk reduction. This agenda is evidence of a strong international consensus to expand the full potential of effective building regulation in reducing risks. This report advocates implementing the *Sendai Framework for Action* through a bold and coordinated international effort to reduce risks in the built environment.

### Report's scope and target audience

This report is a resource to assist policy makers, governments, private sector and donor entities in leveraging good-practice building code regulation into effective strategies for reducing disaster risk and chronic risk, thereby setting disaster-prone countries on track toward effective reform. It provides practical recommendations and a review of applicable innovations for a reform agenda. Both of these components are based on a review of factors that have prevented building codes from being an effective tool for disaster and chronic risk reduction in developing countries.

The report recognizes the significant interdependency between land use management and building regulatory issues. However, its focus is on building regulation and code implementation. At the same time, the report highlights how closely land use management relates to effective building code implementation.

To move from concept to action, the report outlines a proposed Building Regulation for Resilience Program. This program offers a structure to involve and galvanize a wide range of partners with specific strengths and experiences to build a regulatory process applicable to all types of buildings. The strategic goal of the proposed program is to help reduce human and economic losses by avoiding the creation of new risks and by reducing existing risks in the built environment.

## Why building regulation has not yet reduced disaster and chronic risk in low- and middle-income countries

The process of rural-urban migration in the developing world over recent decades has taken place largely in the absence of effective building or land use regulation. Without regulatory guidance, urban development has extended to hazardous sites and resulted in the construction of unsafe, vulnerable settlements. This process of unregulated urbanization has vastly expanded global disaster risk.

The failure of regulatory policy and implementation in low- and middle-income countries has several root causes. Poverty has been a major factor leading to urban migration and a limiting factor in the development of municipal services and regulatory capacity. This failure has been compounded by other factors as well:

**Ineffective land use systems.** Land use systems have failed to limit settlements in hazardous areas and served to exclude a large proportion of the urban population from legal land and housing markets. These factors dramatically increase urban disaster risks. Furthermore, in the absence of effective systems, cities in low-income countries have rapidly expanded into hazardous territory without clear title or critically needed infrastructure.

***Weaknesses in building code administration and institutional capacity.***

A fundamental problem in low- and middle-income countries is the lack of funding and support for building regulation at the local level. The problem is usually rooted in deeper challenges linked to income levels and authority over taxation, as well as in constitutional and administrative structures. Many local governments do not have adequate staff with technical skills necessary to appropriately monitor new construction.

building standards has frequently been a top-down directive that does not sufficiently consult with stakeholders, including both private building professionals and local communities. This has led countries to borrow unaffordable standards from abroad. Thus, building codes in low-income countries have often set the bar too high, creating dependency on imported building materials while stifling local innovation.



***Insufficient legislative foundation.*** Incomplete national legislation has resulted in the failure to establish principles of regulatory implementation or designate public and private responsibilities.

Building regulation often remains unconnected with the larger ecosystem of civil, commercial, and criminal law.

***Unaffordable compliance costs for the poor.***

The process of designing and adopting appropriate

***Insufficient recognition of prevalent building practices.***

Incremental construction—the gradual step-by-step process through which owner-builders append or improve building components as funding, time, or materials become available—is a widespread informal practice. However, formal systems of building codes almost never recognize this type of construction, widening the gap between the formal and informal building sectors.

Photo credit: International Organization for Migration

Post-disaster reconstruction projects have highlighted the fact that owner-builders in low-income settings are capable of integrating risk reduction into their traditional building practices. The coping strategies they have developed should be accepted as a contribution to resilience. For example, *dhajji dewari*, an economical and culturally accepted form of construction in Northern Pakistan, can be modified to safely withstand earthquake forces. In the aftermath of the 2005 earthquake, the region's local building code did not recognize this form of construction, which hampered official funding for *dhajji dewari*'s use in housing reconstruction.

***Dysfunctional regimes of building controls.*** Permitting and inspections services in developing economies are usually expensive, overly complex, and inefficient. Compliance with codes can increase building costs, and these costs can act as a deterrent to meeting code requirements. In Mumbai, India, for example, the formal aggregate administrative fee for going through a tedious 27-step planning and construction permitting process is equivalent to 46 percent of the total construction cost. In Organisation for Economic Co-operation and Development (OECD) countries, however, the same process takes only 11 steps and accounts for 1.7 percent of the total construction cost on average.<sup>6</sup>

***Corruption and regulatory capture.*** Corruption in building code enforcement has been associated with extensive building failure and loss of life in disasters. Recent statistical evidence shows that 83 percent of all deaths from earthquakes in the past three decades have occurred in countries considered most corrupt by Transparency International.<sup>7</sup> Regulatory capture in building code systems can considerably distort outcomes by reducing safety standards to benefit the regulated industry. Conversely, regulatory capture can also result in the increase of safety standards to unsustainable or unaffordable levels, thus excluding local owners and builders.

## The essential components of a building regulatory framework

This report identifies three basic components that form the core of any building code regulatory regime: a legal and administrative framework at the national level, a building code development and maintenance process, and a set of implementation mechanisms at the local level.

However, these core components of a building and land use regulatory framework do not function in a vacuum. In the developed world, regulatory capacity has evolved in parallel with a complex mix, or “ecology,” of supporting institutions. These institutions have provided legal and financial mechanisms as well as certified technical competence required to achieve regulatory compliance. Key elements of this regulatory ecology include the general conditions for commercial development, the rule of law, security of tenure, and functioning building finance and insurance mechanisms.

Important institutions specific to the building sector include accredited building professional education, professional societies and related codes of practice, accredited training institutions for the construction labor force, licensing procedures for building professionals, and quality control processes for building materials.

## A vigorous building regulatory reform agenda to support the Sendai Framework for Disaster Risk Reduction

New urban development between 2015 and 2030 will exceed all previous urban development throughout history. Of the area expected to be urbanized by 2030, 60 percent remains to be built, primarily in South Asia and Sub-Saharan Africa.<sup>8</sup>

The two key priorities of the report's recommendations are

- i. to stop the expansion of disaster and chronic risk in the siting and construction of new settlements; and
- ii. to reduce disaster risk in vulnerable existing settlements.

New construction with appropriate design can be made disaster-resistant for a small percentage of construction cost, on the order of 5 to 10 percent.<sup>9</sup> The retrofit of existing vulnerable structures may require major expenditure, in the range of 10 to 50 percent of building value.<sup>10</sup> Establishing standards and implementation mechanisms for inspection of new construction provides a solid institutional and technical foundation from which to address the significant disaster risk of existing vulnerable settlements.

The report's proposed reform agenda charts closely interrelated strategic actions aimed at reinforcing the regulatory capacity of countries at various stages of development. The following are the main development priorities suggested by the report's recommendations.

1. ***Orienting regulatory and governance reforms toward compliance advice and support rather than just police enforcement.*** Positive experiences from post-disaster reconstruction programs have demonstrated the potential of building advisory services. Through such services, building inspectors would guide builders to code-compliant and safer structures that meet essential standards of safety (as in Central Java, Indonesia, after the 2006 earthquake, or Pakistan after the 2005 earthquake). This supportive and advisory role, coupled with rigorous inspection, should be institutionalized as general practice under normal pre-disaster conditions.

2. ***Developing the capacity of national and subnational institutions.*** A coordinated effort toward disaster risk reduction should address the need for adequate funding, staffing, and execution necessary to implement building and land use regulation at the local level. This requires specific support for training building officials as well as funding to ensure appropriate compensation. It also demands parallel efforts in the development of building and planning education, financial and insurance mechanisms for the management of risk, and public understanding of the importance of safe siting and construction practice.

3. ***Focusing on creating building standards appropriate to the poor and vulnerable.*** Low-income and lower-middle-income countries have the least capacity to cope with disaster losses. Where regulations are unknown, unenforceable, or excessive, most people tend to disregard them, especially the poor. The benefits of a safer built environment should be accessible and affordable for the poor. An open participatory process with representation from all relevant stakeholder groups is necessary to ensure regulatory provisions that represent the values and resources of the community. Consistent with this approach, support should be given to measures that improve security of tenure and reduce the cost of entry to the legal land and housing markets.

4. ***Promoting innovations for effective building controls.*** Experience over the past 20 years suggests that administrative simplification and similar measures can reduce regulatory compliance costs. With appropriate safeguards in place, jurisdictions with high levels of disaster or chronic risk should be able to leverage private sector technical resources to expand the qualified workforce available for regulatory implementation. This approach also holds

the potential of easing the burden of building permitting procedures on local governments. Modern compliance tools to facilitate this process include improved information and communications systems for risk management, building practitioners' certification, private third-party accreditation to provide review and inspection, and the use of insurance mechanisms to augment building control. Moreover, numerous experiences in the field demonstrate that transparency and procedural justice result in greater effectiveness of regulation and compliance; both can be implemented through small, incremental steps. These steps typically include measures that reduce arbitrary discretion in planning and building permit approvals. Such measures also serve to expand the disclosure of information related to technical and administrative requirements.

## A programmatic approach to catalyze investment in regulatory capacity

Priority 3 of the post-2015 *Sendai Framework for Disaster Risk Reduction* calls for a coordinated effort around rehabilitation of building codes and standards. It acknowledges the need for a localized and calibrated approach with a focus on vulnerable settlements, irrespective of the broader income category of the country.

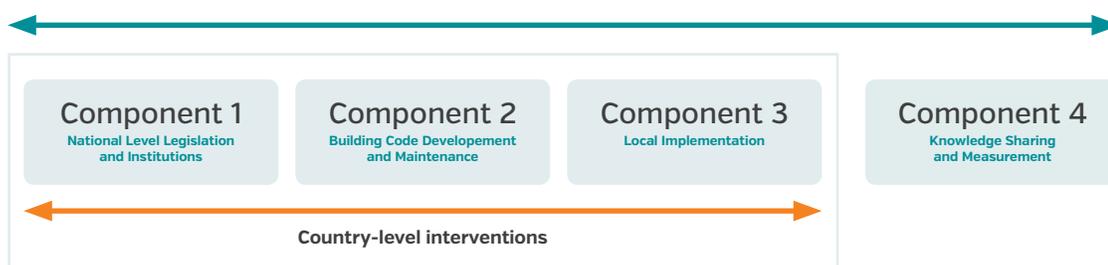
Successfully reducing risk in the most vulnerable areas will considerably depend on how other development initiatives succeed in helping the poor access better and safer housing and essential services. The proposed Building Regulation for Resilience Program, outlined in the last chapter of this report, will create synergies with related programs. These programs include upgrading of informal settlements, affordable housing projects, housing finance, land development and land use policies, regularization initiatives, and post-disaster reconstruction programs.

The proposed program has four components:

**Component 1 - National level legislation and institutions.** Activities under Component 1 will establish or improve national legislative frameworks responsible for mandating the construction of safe buildings and enabling the construction process to proceed efficiently. These activities will be based on locally defined priorities. Additionally, financial investment will aim to fund national hazard mapping programs and to expand the capacity of central authorities.

**Component 2 - Building code development and maintenance.** Component 2 will support the introduction of locally implementable building codes, including the adaptation of national model codes. It will help to establish the basic institutional capacity to develop, adapt, and update appropriate standards of construction through participative and transparent processes at the national level. The criteria for evaluating and improving vulnerable existing buildings will be a particular focus. Direct investment will involve the funding of materials testing facilities and equipment, training of staff, research into safer local construction methods, and funding of programs to accredit product-testing laboratories. Finally, this component will support the broad dissemination of regulatory documentation and the delivery of educational and training programs, which will be based on code-compliant practices, for all elements of the building sector.

**Component 3 - Local implementation.** Activities under Component 3 will focus on the practical administration of the local building department. This will include managing the core functions of building technical assistance, plan review, site inspection, permitting, and enforcement, with the goal of facilitating voluntary code compliance. Advisory activities will give priority to providing outreach services to informal

**FIGURE I.1** – Building Regulation for Resilience Program

sector builders in order to expand access to the benefits of the building safety and regulatory processes. Direct investment in local and municipal building departments will fund building department staff and inspector training, specialized equipment for plan review and inspection, data management, information and communication technology (ICT) applications to facilitate efficient communication with clients, and training of external building practitioners.

**Component 4 - Knowledge sharing and measurement.** Component 4 will provide an international focal point for exchanging experience and innovation related to building regulatory implementation. This component will develop and maintain common tools for assessing regulatory capacity, effectiveness, and efficiency; carry out diagnostics, risk audits, and evaluation of regulatory system capacity; and develop specialized standardized tools for assessment and rating purposes. The evaluations carried out under this component will track progress at the country and local levels. They will also serve as the basis for documenting good practices and identifying opportunities for assistive intervention. Overall, this component will serve as a center for global resources and documentation on the topics of building and land use regulation for disaster and chronic risk reduction.

## A call for action

The world will witness the construction of 1 billion new dwelling units by 2050. Much of this growth will take place in cities with weak capacity to ensure risk-sensitive urban development. The international community must act now to pursue more effective approaches to land use management and building regulation.

Regulatory capacity development in countries and municipalities with high levels of risk can ensure that future construction and urban expansion will be located on safer sites and will be built to protect population health and safety. Building regulation can work as a catalyst to leverage the total investment in building and infrastructure toward greater safety and security. By implementing building regulation and supporting active compliance, the proposed Building Regulation for Resilience Program can accelerate the application of current scientific and engineering understanding to a safer built environment.

Building and land use regulations have proven the most effective tools for risk reduction in the developed world. For a range of reasons, many low- and middle-income countries have not successfully employed these tools. With the initiation of the *Sendai Framework for Disaster Risk Reduction 2015-2030*, there is now an opportunity to act, armed with extensive experience and new approaches.



# Introduction

## Poor-quality construction as the main contributor to expanding disaster and chronic risk

Disaster risk is primarily the product of hazard exposure and vulnerable construction. In the 25 years since the initiation of the United Nations International Decade for Disaster Reduction (UNIDNDR 1990-2000), the expansion of disaster risk due to unsafe development has far outpaced efforts to contain or reduce it.

Over the past 20 years, disasters and natural hazards have affected 4.4 billion people, claimed 1.3 million lives, and caused \$2 trillion in economic losses.<sup>11</sup> These disasters have disproportionately impacted the poor and the marginalized.

In terms of human lives lost, low- and low-to-middle income countries have suffered 85 percent

of total global disaster-related fatalities.<sup>12</sup> A report funded by the Global Facility for Disaster Reduction and Recovery (GFDRR) shows that disasters' impact on gross domestic product (GDP) is 20 times higher in developing countries than in developed countries.<sup>13</sup> These impacts pose a fundamental threat to the World Bank Group's goals of eradicating poverty and boosting shared prosperity.

Current development patterns contribute to the expansion of hazard and vulnerability factors and hence to the expansion of disaster risk. With regard to the generally accepted phenomenon of accelerating climate change, it is clear that CO<sub>2</sub> release is related to an increase in the frequency and severity of hydro-meteorological hazards. As populations and urban centers are increasingly exposed to hazards, extreme geophysical and hydro-meteorological events are causing greater loss of life and property. The concentration of populations in vulnerable informal settlements

through unregulated urbanization may be the greatest contributor to the rapid growth of disaster risk. Currently, some 1 billion people live in informal settlements; by 2020, nearly 1.5 billion people in the developing world will live in slums. By 2040, cities will be home to the majority of people who earn less than \$1 per day.<sup>14</sup>

Vulnerable populations do not only suffer the prospect of catastrophic events, they also suffer from the more insidious and distributed losses of chronic risks, which kill thousands in fires and spontaneous collapse of poorly designed or defectively constructed buildings.

Building codes and land use regulation have a crucial (and thus far insufficiently appreciated) role to play in investment programs for reducing disaster and chronic risk. To be effective, however, building codes and standards must be part of a larger “culture of safety” that includes engineering education and construction skills training as well as legislation, support for implementation, and enforcement strategies.<sup>15</sup>

## Objective

The objective of this report is threefold.

First, it will demonstrate how implementing and complying with building and land use regulation can reduce disaster and chronic risk and contribute to resilient construction. The potential for enhancing building regulatory capacity in low- and middle-income countries is a particular focus.

Second, it will explore the feasibility of using building and land use regulatory implementation to promote public health, safety, and risk reduction, with a focus on rapidly expanding urban areas.

Third, it will call for a renewed and internationally coordinated effort aiming at promoting disaster risk reduction through efficient and effective

building code implementation. As such, the report outlines a proposed programmatic approach consistent with the priorities set out in the *Sendai Framework for Disaster Risk Reduction 2015-2030*.

## A mandate to act now

On March 18, 2015, at the Third UN World Conference on Disaster Risk Reduction, representatives from 187 countries adopted the *Sendai Framework for Disaster Risk Reduction 2015-2030*,<sup>16</sup> making it the first major agreement of the post-2015 development agenda. The Framework includes four priorities for action:

- Priority 1: Understanding risk
- Priority 2: Strengthening disaster risk governance to manage disaster risk
- Priority 3: Investing in disaster risk reduction for resilience
- Priority 4: Enhancing disaster preparedness for effective response and to “build back better” in recovery, rehabilitation, and reconstruction.

Each of the four priorities for action references building and land use regulation development and implementation as a key element of disaster risk reduction. Specifically, clause (h) under Priority 3 states that to meet the framework’s goals, it is necessary

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*“to encourage the revision of existing or the development of new building codes and standards and rehabilitation and reconstruction practices at the national or local levels, as appropriate, with the aim of making them more applicable in the local context, particularly in informal and marginal human settlements, and reinforce the capacity to implement, survey and enforce such codes, through an appropriate approach, with a view to fostering disaster-resistant structures.”*

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### BOX I.1 – Six sets of actions supporting the development of the *Sendai Framework for Disaster Risk Reduction* agenda in the field of building regulations

1. Mobilize financing and incentive mechanisms from support institutions with educational programs through collaborations with the private sector.
  2. Prioritize investment into the regulatory capacity at the local level.
  3. Develop effective building codes, standards, and guidelines for new construction and the existing built environment, including collation of transparent data resources.
  4. Measure progress with specific indicators.
  5. Conduct mapping of regulatory capacity at all levels.
  6. Carry out efforts to increase regulatory compliance and improved resilience strategies within the construction industry.
- Source:* Concluding statement of Building Code Working Session, Third UN Conference on Disaster Risk Reduction, Sendai, Japan, March 14-18, 2015.

A key outcome of the Sendai conference was captured in a statement from its organizers after a session on the role of building regulation in DRR. The statement encouraged the international community to adopt a proactive agenda to develop regulatory capacity. Furthermore, it offered six practical actions to help move beyond the broader objectives of the *Sendai Framework* to more tangible measures to reduce risks in the built environment (see Box I.1).

This positive outcome drew upon a multistakeholder review of the Hyogo Framework for Action (HFA)'s progress, which was prepared for the United Nations General Assembly in May 2014. The review emphasized the need to enhance good practices in disaster risk reduction, including standards setting for building codes, land use, and preparedness.<sup>17</sup>

As the Sendai outcome and its foundations in the HFA review suggest, there is a strong international consensus for exploiting the full potential of effective building regulations in reducing risks. This goal can be accomplished through renewed investment in regulatory capacity and functioning governance mechanisms. Insofar as it calls for an innovative international approach to disaster risk reduction, the *Sendai Framework for Action* agenda provides a robust platform for action in the 15 years to come.

## Key factors contributing to the expansion of disaster risk

Several factors have contributed to the growth of disaster losses and the continued growth of disaster and chronic risk.

### Rapid urbanization without effective regulation

Urbanization continues to concentrate people and the urban systems they depend on. The world will witness the construction of 1 billion new dwelling units by 2050 and a doubling of urban building stocks in the next 20 years.<sup>18</sup> Some 60 percent of the area expected to be urban by 2030 is in Asia,<sup>19</sup> and much of this area will likely be subject to natural hazards.

The developing world has witnessed massive rural-urban migration over the past century. This dramatic increase in urban populations has largely taken place without the benefit of building or land use regulation. Consequently, the percentage of the population in vulnerable buildings on hazardous sites has expanded. For example, the number of people likely to be exposed to tropical cyclones and earthquakes in large cities will more than double by 2050—from 310 million to 680 million and from 370 million to 870 million, respectively.<sup>20</sup>

## Climate change

Weather-related disasters affect developed and developing countries, with highest impacts in middle-income countries. The largest coastal cities could experience combined disaster losses of \$1 trillion by mid-century, as climate change resulting from increased greenhouse gas emissions has increased the intensity and frequency of severe weather and related events (hurricanes, flooding, mudslides, and so on). By 2030, there will likely be 325 million poor people in Sub-Saharan Africa and South Asia, and they will be vulnerable to weather-related events.<sup>21</sup>

## Growth of informal settlements

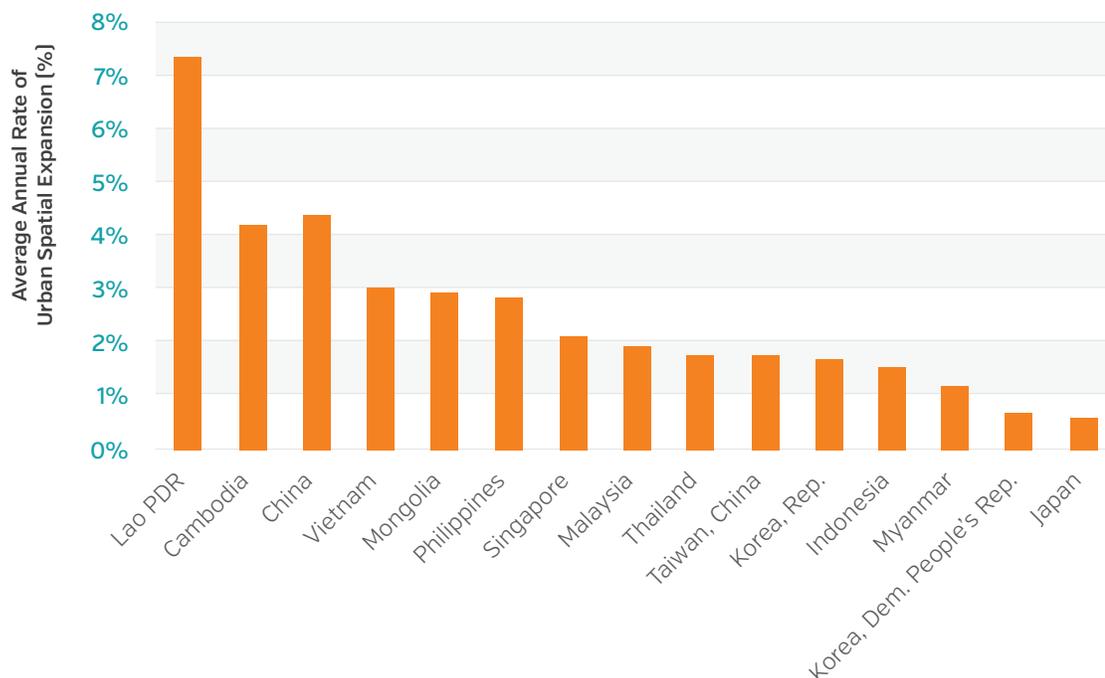
Urbanization has been a significant engine of economic growth, extracting millions of people

out of poverty through access to jobs, education, and technology. However, this growth correlates with a significant increase in urban risks in the built environment—risks that can seriously erode the path out of poverty for millions. Over 103 million new slum dwellers have been added to the global population between 2000 and 2012,<sup>22</sup> and a majority of them are settled in disaster-prone areas.

Rapidly expanding urban areas are frequently established informally, without the benefits of risk reduction and guidance from building or land use regulations. Informal settlements often give rise to slums that suffer from overcrowding and a lack of basic urban services, including clean water, sanitation, electric power, employment, access to transportation, and access to health and educational facilities.

**FIGURE I.2 – Annual rate of urban expansion by country (2000-10)**

Source: *East Asia's Changing Urban Landscape: Measuring a Decade of Spatial Growth*, 2015, World Bank



**Failure to apply knowledge to practice**

Our understanding of disaster and chronic risk has benefited from recent developments in science and engineering. For example, in the past 20 years, significant advances in the natural sciences have made possible the characterization and mapping of hazard events. Hydrological, meteorological, and geophysical hazards can now be charted in terms of frequency, intensity, and location. The world has also witnessed the rapid expansion of instrumentation in modeling and mapping for seismic micro-zonation using geographical information system (GIS) technology. This is an important step toward improved seismic risk analysis and mitigation.

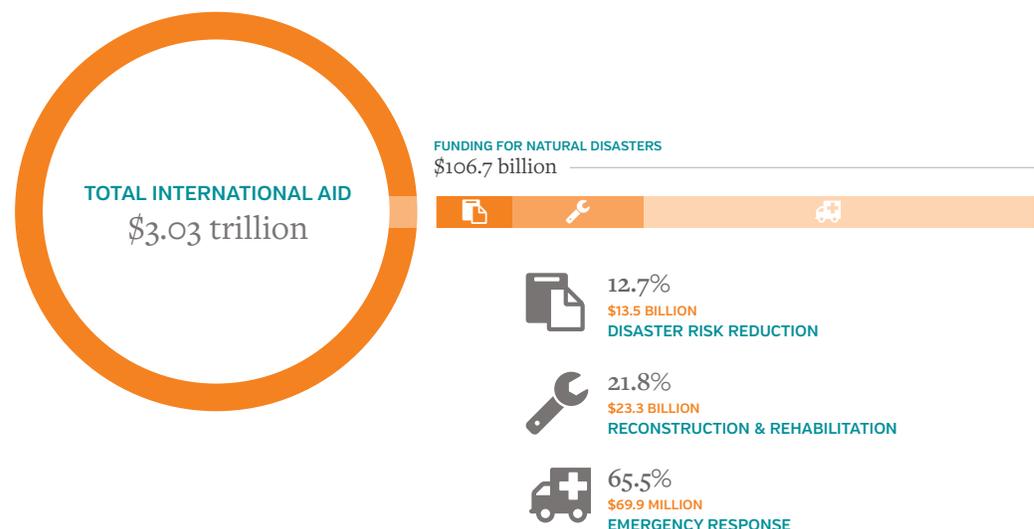
In addition, engineering research has considerably improved understandings of material and structural performance of buildings and infrastructure; this is useful in evaluating seismic risks. Strong motion instruments placed in buildings measure how the structures respond to earthquake-induced ground motion. Therefore, when strong earthquakes occur, new data are gathered that enable engineers to improve structural and building code design requirements. The 1971 San Fernando earthquake

in California provided data from instrumented buildings that supported significant improvements in seismic building codes, and eventually led to the creation of the National Earthquake Hazards Reduction Program (NEHRP), which conducts earthquake research and its application to code improvement.

The primary way that new scientific and engineering knowledge gets applied to design and construction is through building and land use regulatory regimes. However, where building and land use regulatory systems have been largely absent or neglected, there has been little benefit from scientific and engineering advances in improved building safety.

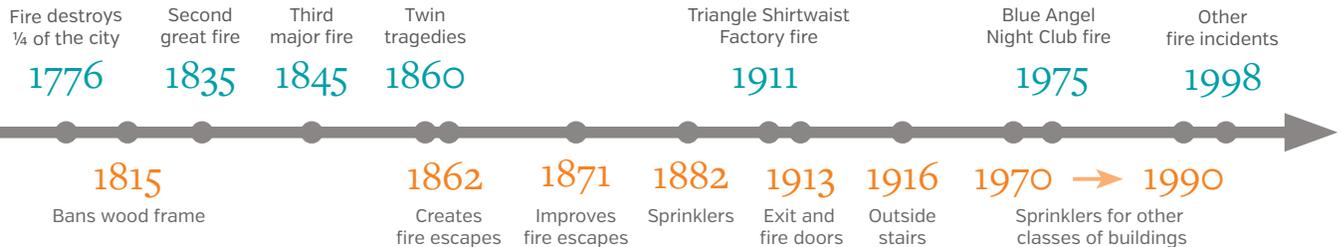
Globally, there has been very limited investment in increasing building regulatory capacity for disaster loss reduction. Between 1991 and 2010, the international community committed just over \$3 trillion in development assistance. Of this, \$106.7 billion was allocated to aspects of disaster resilience, primarily to post-disaster relief and recovery; only \$13.5 billion was allocated to risk reduction measures. For every \$100 spent on development aid, just 40 cents have been invested

**FIGURE I.3 –** Disaster financing as a proportion of total international aid, 1991-2010



**FIGURE I.4 –** Fire events & regulatory response in New York City (1776-2000)

## Major Fire Events in New York City



## Building Code Response

in disaster loss reduction. Flood prevention measures accounted for more than 90 percent of all disaster risk reduction expenditures.<sup>23</sup> This unbalanced distribution of funding has constrained the growth of institutions and tools needed to promote safe development and resilience, specifically through the application of scientific and engineering knowledge.

## Successful risk reduction in developed countries based on building and land use regulation

In developed countries, successful mechanisms of risk reduction and hazard adaptation have relied in large part on effective and efficient regulation. Regulations have dramatically reduced the incidence of urban conflagration and epidemic disease over the past two centuries. The proximity and density of urban development in Europe and North America made this elaboration of regulatory measures necessary.

### Incremental development of regulatory capacity

The implementation and expansion of building and land use regimes in developed countries has evolved incrementally over time. This process has created increasingly resilient systems able to sustain chronic and exceptional risks.

The city of New York was devastated by fires three times in the late 18th and early 19th centuries. Each major incident contributed to a greater understanding of fire hazards and urban vulnerability. The regulatory institutions of the city served as the repository of this knowledge and, through code development and implementation, were able to improve building practice for fire resistance in small and incremental steps. Through an institutionalized regulatory process, these accumulated responses contributed to collective knowledge and experience in the form of building codes that reduced the incidence of fires over time. As shown in Figure I.4, the occurrence of fire events in the city has been closely linked to a continuous, dynamic, and incremental process of regulatory responses to evolving risks and practices

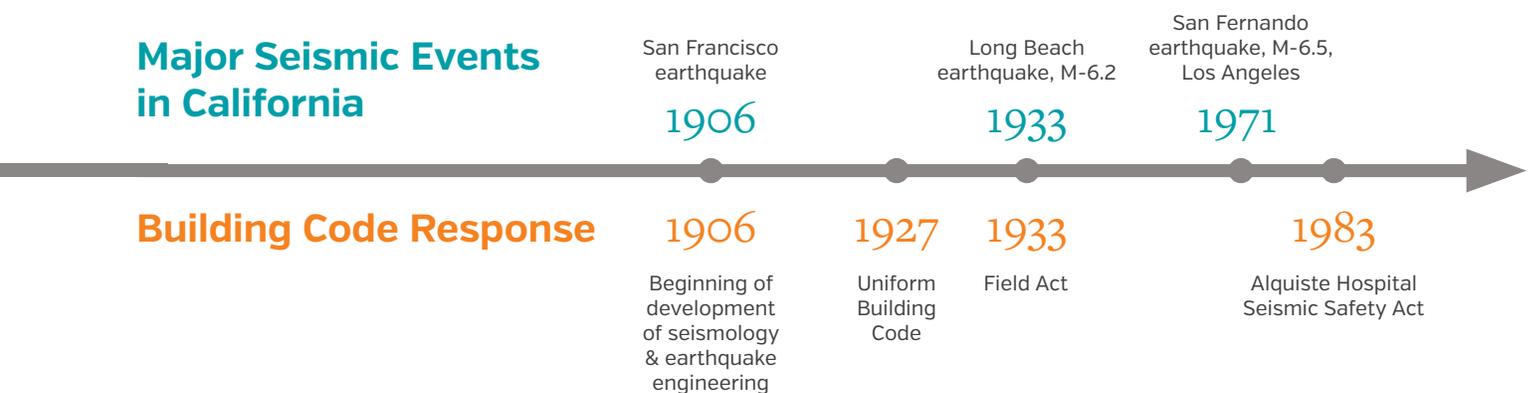
in construction. Today, with a sustained rate of less than 1 fire death per 100,000 inhabitants, New York City is one of world’s best-performing cities.<sup>24</sup>

The history of seismic risk reduction in California offers a compelling example of an incremental regulatory response expanded and improved over the last 110 years. The 1906 San Francisco earthquake stimulated the development of seismology and earthquake engineering through research and testing. Subsequently, the 1927 Uniform Building Code provided the first comprehensive earthquake design provisions. In 1933, a 6.2-magnitude earthquake struck Long Beach, California, and many of the unreinforced-masonry schools in the city suffered significant damage. Impressed with the loss of life that might have occurred if schools had been in session, the California legislature quickly passed the Field Act. This legislation required special earthquake design for public schools in addition to strict plan review and site inspection for all new schools by the Office of the State Architect. No school building in California has collapsed in an earthquake since the implementation of the Field Act.

In 1971, the 6.5-magnitude San Fernando earthquake struck the Los Angeles metropolitan area. Two hospitals suffered major damage. In response to this experience, in 1983 the legislature passed the Alquist Hospital Seismic Safety Act, which increased design requirements for new hospital construction and set a deadline for the seismic retrofit of all existing hospital buildings. The act also established the Seismic Compliance Unit in the Office of Statewide Health Planning and Development. Experience from frequent seismic events has contributed to continuous improvement of seismic codes and resulting building performance in earthquakes. In sum, California illustrates the evolutionary and dynamic process of regulations with no definite end in sight. These regulations for schools and hospitals remain in a state of evolution today as engineers learn new lessons from earthquakes around the world.

Regulatory process is accomplished at a very small percentage of total construction costs. In Organisation for Economic Co-operation and Development (OECD) countries, the added cost of a functioning permitting and inspection system is about 1.7 percent of total construction cost.

**FIGURE I.5 –** Seismic events & regulatory response in California



The cost of establishing and maintaining a functioning regulatory system is dwarfed by the potential cost of disaster losses. Haiti suffered losses equal to 120 percent of the country's GDP after the devastating earthquake of 2010. Typhoon Yolanda displaced 4 million people, destroyed half a million houses, and pushed more than 2.3 million people back into poverty after hitting the Philippines; consequently, the poverty rate increased nearly 15 percent.<sup>25</sup> Similarly startling statistics apply to many more countries worldwide.

### Tangible return on investment

Studies conducted in countries with more established building regulatory regimes consistently show that the benefits of up-to-date building codes outweigh any increase in compliance costs:

- A study done by the U.S.-based Insurance Institute for Business & Home Safety (IBHS) found that losses from Hurricane Andrew, which hit the states of Florida and Louisiana in 1992, caused more than \$20 billion in insured damage. This loss would have been reduced by 50 percent for residential properties, and by 40 percent for commercial properties, if the structures had been built in accordance with Florida's 2004 statewide building code.<sup>26</sup>
- Another IBHS study following Hurricane Charley, which hit Florida in 2004, found that conformance to current building codes reduced the severity of losses by 42 percent and loss frequency by 60 percent.<sup>27</sup>

Effective building regulatory systems bring about other societal benefits beyond chronic and disaster risk reduction. They can offer high returns for other policy objectives. Energy efficiency and CO<sub>2</sub> reduction from buildings is a good case in point: a task force led by the Institute for Market Transformation found that every dollar spent on code compliance and enforcement returns six dollars in energy savings, equivalent to a 600 percent return on investment over time.<sup>28</sup>

## Key priorities

This report presents a set of interrelated, actionable priorities for risk reduction. These priorities set boundaries for the discussion and provide the framework within which recommendations are articulated. They have informed the outline of the proposed program developed in the last chapter.

### *Focusing on building regulatory regimes.*

Building and land use regulations are closely intertwined and cannot readily be treated as separate issues. However, this report places primary emphasis on building regulatory regimes, with specific focus on the core implementation activities of plan reviews, inspection, and compliance assurance. These activities have received little attention in the context of DRR.

### *Recognizing the larger regulatory "ecology" that supports effective building code implementation.*

Beyond the core activities of a building code regime, there are contributing organizations, regulatory mechanisms, and institutions that are essential to achieving compliant, safe construction. This report acknowledges the important role of these institutions, which may include educational and training institutions for the building professions; accrediting bodies for professional education and building control; certification processes for contractors and developers; mortgage lending institutions qualified for building finance; property insurance and professional liability insurance for building professionals; and free and functioning real estate and land markets.

### *Addressing the needs of the poor and vulnerable, primarily in low- and middle-income countries.*

This report's focus on the poor and vulnerable does not attempt to exclude other segments of the population. Rather, it seeks to address those with the least capacity to cope



with disaster losses. Between 1980 and 2012, low-income countries have accounted for only 9 percent of the total number of disasters while incurring 48 percent of fatalities.<sup>29</sup> Where regulations are unknown, unenforceable, or excessive, most people tend to disregard them, especially the poor. This report advocates large-scale educational efforts and implementation mechanisms appropriate and affordable for the disadvantaged. These efforts should accommodate incremental regulations compatible with incremental construction, adequate incentives, and compliance support.

*Ensuring the safety of new construction and reducing the risk of existing vulnerable settlements.* A primary objective of this report is to limit the expansion of disaster and chronic risk in future urban development. This is critical insofar as building stocks are projected to double in the next 20 years in most emerging economies. Clearly, initial location of safe sites is inherently more economical than relocation of existing settlements. Likewise, achieving disaster resistance in new construction is considerably less costly than retrofitting existing vulnerable construction.

However, given the populations currently exposed to disaster risk through existing unsafe structures, it is imperative that provisions for assessment and strengthening of vulnerable buildings be incorporated in the building regulatory initiative. Realistically, risk reduction in existing buildings will be a long-term priority. The development of regulatory capacity for new construction will provide a foundation for extending regulatory practice to the inspection and improvement of existing buildings.

***Creating the structure to deal with chronic health and safety risks.*** This report takes the view that a building code regulatory regime will address disaster risks effectively by extending the institutional capacity needed to address everyday hazards such as fire, building collapse, epidemic, and unhealthy living conditions. Investment in building regulatory capacity has the double benefit of reducing loss to both chronic and disaster risks. Chronic risks and smaller disasters (such as individual building collapses) are rarely recorded, and rarely covered by government, insurance, or international assistance. The cost of impacts associated with small disasters tend to be absorbed directly by low-income rural and urban households. They are estimated to be 50 percent higher<sup>30</sup> than those formally recorded in global databases.

***Promoting compliance rather than police enforcement.*** Although a traditional police enforcement function is necessary, it should be actively complemented by positive technical assistance and support for voluntary code compliance. This is particularly true for efforts to expand regulatory service delivery toward the informal sector. This report argues that understanding behavioral drivers, and the set of values upon which an effective regulatory system should be established, is crucial. In concrete terms, an effective reduction in risk requires more innovative and nontraditional regulatory

approaches (such as guidance and educational effort typically deployed in reconstruction programs), which should be adopted and institutionalized in the mainstream permanent regulatory system for an effective reduction of risk.

***Leveraging private sector to expand technical resources for code implementation.*** Experience over the past 20 years points to the potential of leveraging private sector technical resources to expand the volume and quality of technical manpower available for review and inspection functions. Modern compliance assistance tools include improved information systems on risks, building practitioners' qualifications, private third-party checks, and the use of insurance-based incentives to reinforce building controls. This report highlights promising experience in this area that contributes to increasing the capacity of regulatory systems and reducing risks. Far from a deregulation agenda, this approach promotes collaboration with private sector expertise that can strengthen the ability of building regulatory authorities to protect public health and safety and enhance resilience.

## Report structure

*Chapter 1* examines the current status of building and land use regulatory capacity in a range of low- and middle-income countries. Specific weaknesses are identified, described, and illustrated in brief case examples.

*Chapter 2* outlines the basic components of established building regulatory regimes and illustrates essential regulatory functions.

*Chapter 3* presents recommendations for building regulatory development and reform based on problems identified in Chapter 1 and successful regulatory reforms identified in Chapter 2. This chapter sets forth an agenda to establish an effective building code regulatory reform articulated around seven major streams of action.

*Chapter 4* outlines an integrated programmatic approach for building regulatory capacity development. This approach is consistent with challenges examined in Chapter 1 and with recommendations proposed in Chapter 3.

# Why Building Regulation Has Not Reduced Disaster and Chronic Risk in Low- and Middle-Income Countries

## 1.1– Introduction

### Obstacles to effective building and land use regulation

In recent decades, the acceleration of rural-urban migration in the developing world has taken place largely in the absence of effective building or land use regulation. Without regulatory guidance, urban development has extended to hazardous sites and resulted in the construction of unsafe vulnerable settlements. This process of unregulated urbanization has led to a vast expansion of global chronic and disaster risk.

The failure of regulatory policy and implementation in low- and middle-income countries has several principal root causes. Rural poverty has been a major reason for urban migration, and poverty has been a limiting factor in the development of municipal services and regulatory capacity. Disregard for factors contributing to risk, in terms

of hazard exposure and unsafe construction, has led to dramatic expansion of vulnerable informal settlements. The failure of building regulation has been compounded by poorly formulated and poorly communicated building codes. Corruption of local regulatory authorities, where they do exist, has further compromised implementation of and compliance with safe building and land use principles.

Physical and social challenges arise in the context of high-density urban development that require more sophisticated institutions to manage the balance between individual interests and the health, safety, and general welfare of the community.

For millions of people in the developing world, it is primarily the absence of relevant codes and building standards, their inability to get their own voices heard in standards development processes, the high costs of compliance, and the lack of a supportive institutional environment which have

impeded their access to safer and affordable housing in the formal sector. Consequently, although building regulation has successfully reduced risks in developed countries, incomplete and inept regulatory implementation has often failed to protect lives and property in low- and middle-income countries.

The purpose of this chapter is to describe the major systemic problems and failures in regulatory governance typically experienced in the extension of regulatory capacity in low- and middle-income countries.

**Deadly consequences of unregulated development**

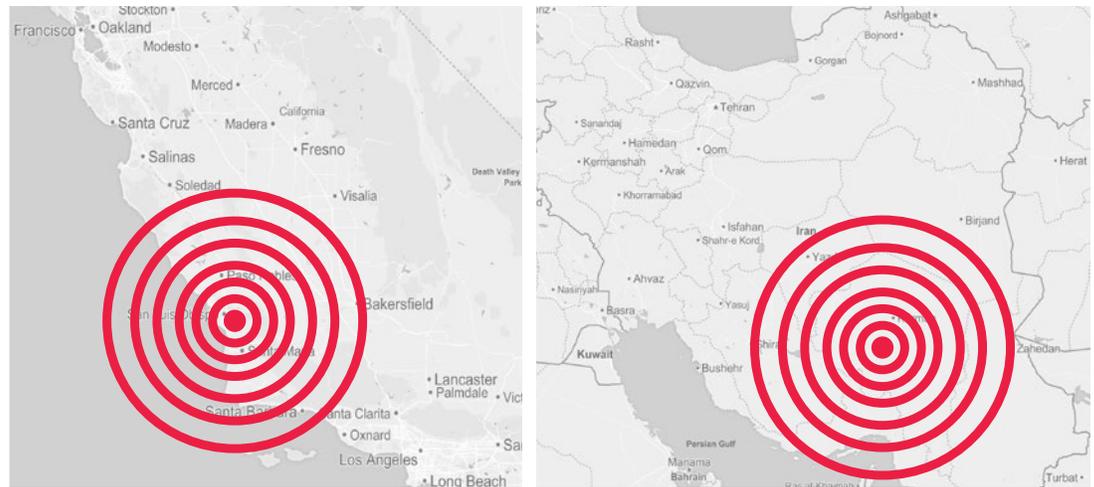
Earthquakes are the deadliest natural hazard. In developing countries, earthquake-induced building collapse kills many people. Although earthquakes represented only 4 percent of all hazard events

between 2000 and 2009, they were responsible for 60 percent of disaster-related deaths in low- and middle-income countries.<sup>31</sup> Experience in the developed world has demonstrated that improved design, construction, and regulatory compliance can dramatically reduce life loss in earthquakes.

In 2003, the Paso Robles, California, and Bam, Iran, earthquakes had similar magnitudes and struck within three days of each other. However, the death toll was two in Paso Robles as opposed to more than 40,000 in Bam—nearly half the city’s population.<sup>32</sup>

**Failure to address both chronic and disaster hazards**

Chronic health and safety risks related to the built environment are underestimated and overlooked. Efforts to reduce the risk of large-scale acute events may have obscured appreciation for the cumulative



Paso Robles, California		Bam, Iran
Population: 30,000		Population: 90,000
December 26, 2003		December 23, 2003
6.6 Richter		6.5 Richter
2 died		40,000 died
46 buildings damaged		50 percent of city destroyed
Code-compliant buildings		Buildings not code-compliant
Designed & built by qualified professionals		Informal buildings

**FIGURE 1.1 –** A Tale of Two Cities: The Paso Robles and Bam earthquakes of December 2003

Source: Noel DaCosta, August 2010

impact of smaller chronic risks. Increasing evidence suggests that the cumulative impacts of everyday hazards resulting in small, isolated losses are actually greater than those of large disasters resulting from extreme events.<sup>33</sup> The impacts of the former in low- and middle-income countries are widely misjudged, as they regularly fail to meet the criteria to qualify as “disasters” in international databases. As a result, a significant share of damage to housing, infrastructure, and low-income households affected by small disasters has been poorly reported and overlooked.<sup>34</sup>

Research on African urban centers points out that a large share of the urban flooding, disease, epidemics, large shack fires, and spontaneous building collapses that occur in these locations does not get recorded as a “disaster” in national and international databases.<sup>35</sup> Each year, however, thousands are killed by fires in, or the spontaneous collapse of, poorly designed or constructed buildings or structures. In India, for example, 2012 saw more than 2,600 deaths and 850 injuries as a result of the spontaneous collapse of 2,737 building structures.<sup>36</sup>

In April 2013, an eight-story commercial building collapsed in Bangladesh, killing over 1,200 people. This is another tragic reminder of the need to improve the safety of people from chronic risks. The benefits of building safety regulation should expand to all vulnerable segments of the population.

A particularly strong pattern of cumulative fires and spontaneous building collapses in Kenya over the past 20 years further illustrates how systems of building code regulation can fail in dealing with chronic risks. Over time, the aggregated loss of human lives and infrastructure in some of the largest cities in Kenya can be unequivocally defined as a disaster of significant proportions.

Failure to develop and implement effective building regulation is doubly detrimental to low- and middle-income countries. Not only do they suffer

the prospect of catastrophic loss due to major disasters, they are also impacted by the continuing, distributed losses of chronic threats to health and safety such as fire, building collapse, epidemic, and unhealthy living conditions.

This chapter describes the major factors limiting the effectiveness and efficiency of regulatory frameworks in low- and middle-income countries. These factors are related to

- Land use and land governance systems;
- Legislative foundations for effective building code regulatory regimes at the national level;
- Building code design and building standards of construction;
- Building code administration and institutional capacity; and
- Concerns with the efficiency of building code implementation procedures.

### FIGURE 11 – The accumulation of chronic risk: The case of Kenya

**MAY 1996:** Collapse of a supermarket during heavy downpour

**MARCH 1998:** Fire in dormitory building in the Coast Province

**MARCH 2001:** Fire in similar incident in Machakos District

**MARCH 2004:** Destruction of Planning Department by fire

**JANUARY 2006:** Collapse of two-story building under construction in Nairobi

**JULY 2006:** Major fire in industrial building in Nairobi

**APRIL 2008:** Building collapse in Nairobi

**OCTOBER 2009:** Three-story building collapse in outskirts of Nairobi

**JANUARY 2010:** Two-story building collapse in Kiambu

**JUNE 2011:** Collapse on Langata Southern Bypass Building in Nairobi

**DECEMBER 2014:** Five-story building collapse in Makongeni

**JANUARY 2015:** Six-story residential building collapse in Nairobi





## 1.2– Failures of urban land management

The provision of safe land is the most vital step that local governments can take toward controlling disaster and chronic risk in urbanizing areas. It requires regulatory mechanisms enabling the urban poor to access land that is not in high-risk areas as well as regulations that allow for tenure security, both for business and housing, in an affordable manner.<sup>37</sup>

In dysfunctional regulatory systems, however, land management policies have typically failed to ensure land access, to link advances in hazard mapping with effective building code implementation, and to secure land rights in order to encourage investment and acceptable standards for the environment and for safe construction. As a result, land use regulation has contributed to a shortage of safe land, failed to limit settlement in hazardous areas, and often served to exclude a large proportion of the urban population from legal land and housing markets. These factors have significantly compounded risks for very large segments of rural and urban populations.

### Unavailability of affordable, safe, and accessible land

A critical factor forcing many urban dwellers into the informal sector is the extreme scarcity of land, which leads to prices that are unaffordable—not only to the poor, but also to the middle class. Land is now under pressure everywhere as a result of increased demand and speculation. There are two major consequences related to excessive and speculative land prices.

First, for low-income people, the very high price of buying or renting a piece of land absorbs the bulk of financial resources available for housing. This in turn limits their capacity to invest in safer building materials, construction, and skilled laborers, even where these would be available at a reasonable price.

Second, a significant portion of the population cannot afford formal land tenure and thus are forced to choose informal land markets. In the Philippines, for example, high land prices are considered one of the main reasons driving about 40 percent of people to live in informal settlements. A detailed investigation found that the average cost of a house in an informal settlement costs roughly 10 percent of the price of a comparable unit in the formal sector.<sup>38</sup>

As a consequence of this significant price difference between formal and informal housing, both low- and middle-income households have few options other than informal housing sectors, where vulnerability to chronic risks and natural hazards is considerably higher.

### Missing linkage of hazard mapping to effective risk reduction

Over the past decade, significant progress has been made in various parts of the world to map hazard exposure in terms of frequency and severity of expected events. Notably, the Probabilistic Risk

Assessment Program (CAPRA)<sup>39</sup> in Central America has developed scientifically-based probabilistic risk assessments for seismic and wind risks. Improved earthquake risk mapping has similarly been the focus of the GEM (Global Earthquake Model) program.

These efforts are essential to risk reduction, but in themselves do not achieve that objective. Hazard mapping can only be translated into risk reduction through the effective implementation of building and land use regulation. This is why such efforts repeatedly fail to achieve their desired goals. The zones of the hazard map must be referenced to corresponding building requirements, and those requirements must become the basis for design, construction, inspection, and compliance. Without a functioning building regulatory regime, hazard mapping has no direct link to disaster risk reduction.

Many countries that have benefited from recent hazard mapping still lack key components of effective regulatory implementation and have therefore not benefitted from any significant reduction of risk. Such is the case for Jamaica, which has recently completed its first seismic, wind speed, rainfall, floodplain, and land slippage hazard maps. But implementation of the building code is still impeded by delays in promulgating necessary legislation and more effective enforcement systems.

Haiti is also a case in point. After it was struck by an earthquake in 2010, a seismic zonation study was carried out for Port-au-Prince. However, in the absence of an effective building code implementation, the existing hazard mapping has not yet been applied to effective risk reduction. Similarly, India has an earthquake risk map and a hazard atlas, but not a uniformly functioning building regulatory regime across the country.

## Consequences of insecure land tenure

Security of tenure is of pivotal importance to motivate investment in sustainable and safe infrastructure and housing. While there are different forms of tenure, two core components include reasonable duration of rights and effective legal protection against eviction or arbitrary curtailment of land rights.

In 2005, an estimated 934 million people lived without security of tenure in informal settlements. This number is projected to increase to 2 billion by 2030.<sup>40</sup> More than 90 percent of the rural population in Sub-Saharan Africa accesses land via legally insecure customary and informal tenure systems, as do 40 million Indonesians and 40 million South Americans.<sup>41</sup> Without secure tenure, people fear eviction and demolition of their homes. An estimated 5 million people worldwide suffer from forced evictions each year. Those with no or weak security of tenure are unlikely to invest in improving their homes or neighborhoods. They are even less likely to invest in more resilient construction or retrofit. The lack of tenure security is not only related to a deliberate illegal occupation of land, but is often caused by unpredictable, costly, and time-consuming procedures associated with land registration. In Tanzania, for example, there are an estimated 28 steps which must be completed before a plot can be legally developed. In Lesotho, it can routinely take 18 months to complete the documentation for a lease before development can even start.<sup>42</sup> Similar cases can be cited in many other countries.

As a result of widespread failure to provide tenure security, an increasingly large proportion of residents in low- and middle-income countries are not willing to make investments in property improvement or safety. In sum, they are deprived of the opportunity to accumulate wealth in the form of improved housing and security.

### 1.3– Insufficient legislative foundation for effective building regulation at the national level

While the local level is key for implementing and enforcing building regulation, this local authority must be solidly based on national legislation that defines the public role in protecting public health, safety, and welfare in the built environment. National legislation must outline roles and responsibilities of subordinate agencies of government and devolve regulatory authority to appropriate levels of government. Consistent and complementary national legislation is necessary to establish the legal framework in which building regulation can be implemented. This includes legislation governing the certification of building professionals and regulation of the property insurance and mortgage banking industries.

Incomplete national legislation fails to establish principles of regulatory implementation and does not designate public and private responsibilities. Moreover, it often fails to connect building regulation with the larger ecosystem of civil, commercial, insurance, and criminal law.

For example, the Steering Committee of the Jamaican National Building Code began developing a new building code for Jamaica in 2002. The work of the committee initially focused on strictly technical aspects of building standards development and adaptation. However, it soon became clear to the committee chairman, engineer Noel DaCosta, that a parallel legislative effort was equally necessary to establish a complete system of compliance and responsibility. In the words of Mr. DaCosta:

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*“Producing code documents cannot by itself guarantee their usage or effective implementation. Consideration had to be given to the preparation of legislation,*



## BOX 1.2 – How innovative building control regulations in Turkey were impaired by the absence of sufficiently supportive legal frameworks

The government of Turkey quickly adopted Decree 595 in 2000 following the previous year's earthquake. Although it was not perfect legislation, many of the decree's new robust mechanisms for controlling construction were considered revolutionary by international standards. It was one of the most spectacular and focused regulatory responses in building code regimes following a disaster of this scale. The decree showed an exceptional level of attention to delivery and building code implementation mechanisms for private construction (public institutional buildings were excluded from the scope of the legislation).

However, concomitant changes that should have happened in several provisions of national civil, commercial, and insurance laws were not introduced. This lack of action served to undermine the reform and bring it rapidly to an end. The decree was eventually rescinded in May 2001 by Turkey's Constitutional Court. National legislation failed to bring essential provisions to support the reform initiated in 2000. This was reflected in the following issues:

- No oversight of the supervising construction firms was introduced by the new legislation.
- Public buildings were still to be supervised by engineers from the Ministry of Public Works, but no qualification requirements applied to these engineers not mentioned in the 2000 legislation.

- No legal requirement was applied to archiving design calculations and drawings for later judicial referral if needed, which impaired conflict resolution.
- Conflicts existed between the 2000 decree and the provisions in Turkish legislation regarding the payment of liability exceeding 10 years.
- No legislation existed supporting the Provincial Supervision Commission, an oversight mechanism created by Decree 595 to monitor the firms supervising the new building construction.
- No clarity was provided on how the mandatory earthquake insurance legislated by the Turkish Catastrophic Insurance Pool [TCIP] would be consistent with the new liability mechanism.
- Finally, there were serious loopholes and a lack of clarity on qualification requirements for building professionals and the way new licenses should be granted—a factor compounded, at the time, by obstruction from professional societies.

Source: Adapted from Gülkan 2010.

*training and compliance methodologies. In particular, it would require drafting a Policy Framework Document, a new National Building Act for Jamaica and detailed regulations under the Act.*<sup>43</sup>

In the case of Jamaica, a technical initiative to develop a local building code (adapted from the International Building Code developed by the International Code Council) gradually transformed into a more comprehensive effort. This reformed agenda sought to ensure that the new code could be practically enforced through appropriate national supporting legislation and educational programs.

The understanding of the legal support mechanisms for successful building code compliance, as well as the timely passage of enabling laws, can be particularly critical in driving the success of regulatory reforms.

Following the 1999 Kocaeli earthquake in Turkey, the central government took bold action in promulgating Decree 595 in 2000. The decree introduced profound innovations in building controls, such as an increase in qualification requirements for building designers. Additionally, the decree introduced the concept of certified private construction supervision firms tasked with verifying design calculations and code compliance of the actual construction. The decree also required building designers to carry mandatory 10-year professional liability insurance for each project.

Unfortunately, this impressive reform effort came to an abrupt end in 2001. The progress toward disaster risk reduction was opposed by elements of the building and real estate industries, who saw that the new requirements could disadvantage current professionals and add marginal cost to new construction. In addition, government efforts failed to coordinate this initiative with other important national legislation. Such action is

crucial; coordination serves to remove uncertainty and establish clear lines of accountability in enforcement, thus providing detailed qualifications requirements for building professionals, clarifying the commercial status of the newly designated supervision firms, and providing resources to newly created regional construction oversight bodies (Box 1.2).

Another form of bottleneck at the national level is not necessarily the resistance of national legislative authorities to develop underpinning legislation. Rather, it derives from delays in organizing the required consultations, endorsing legal drafts, implementing regulations by appropriate line ministries, and completing the legislative process.

Early in Jamaica's new building code development process (approximately 2006), the queue for work coming out of the Office of the Chief Parliamentary Counsel was 10 years long—suggesting that without special provisions, the new Building Act would not see the light of day until 2016. At the time of writing this report, the new Building Act has not yet been passed by Parliament.

## 1.4—Inadequate building codes

### Inappropriate transfer of codes from high-income countries

To a large extent, the normative environment for construction, land use, and planning standards in developing countries has been strongly influenced by frameworks introduced during periods of colonial rule. Such codes often set the bar too high and thereby increase the dependency of developing countries on imported industrialized building materials and design practices. Furthermore, these codes frequently create high costs of compliance with a result of driving construction to the informal sector.

In Jamaica, it was estimated that only the wealthiest 15 percent of the population could afford housing that met the current formal planning and building standards. In Trinidad and Tobago, it is estimated that only the top 20 percent of the population can afford the median price of \$21,500 for a housing unit that meets current formal building standards. Code compliance is not feasible for low-income housing. As a result, low-income housing fails to benefit from health and safety regulations. This trend is now widely reflected globally.<sup>44</sup>

In sum, excessively rigorous and unattainable standards of construction have been a major obstacle for the expansion of regulatory compliance in the past four decades. Only relatively wealthy urban residents have been able to afford buildings that meet formal sector building regulations, thus creating cities with entrenched two-tier systems, widening social inequalities, and limiting progress on risk reduction.

Building codes are expressions of both social and technical principles. In order to achieve feasible compliance, they must reflect the social reality and the material possibilities of the society in which they are to be implemented.

### Participation in balancing acceptable risk and affordability

The code development process in most low- and middle-income countries, where it exists, is typically a bureaucratic process dominated by narrow technical concerns. If the code is to be relevant and feasible for implementation for all elements of the built environment, the development process must be open to broad participation, with representation from all sectors of the building industry as well as building owners, occupants, civil society, and scientific and engineering experts. Feasible building codes represent a socially acceptable balance between

risk and affordability. This balance should be determined through an open and inclusive process that can be accepted as fair and legitimate.

Narrowly framed technocratic regulation can have adverse consequences for low-income groups, setting unaffordable standards for building plot size or construction technique. Unrealistic standards lead to noncompliance and defeat of regulatory purpose.

Negotiation of code provisions should be based on a consensus process that represents the relevant stakeholders concerned with both the costs and benefits of safety. The goal should be to balance the costs of regulations with the ability of people to pay.

However, governments at the national and local levels sometimes lack the capacity to lead participatory efforts, and for three reasons: They may not be operating within a sufficiently accountable environment, they may lack the political structure to translate social priorities into

specific regulatory measures, or they may lack the capability to conduct these consultations.

A participatory approach may simply be overlooked, as illustrated by the Zimbabwe example (Box 1.3). It may also be established without necessarily attaining an acceptable level of societal consensus by appropriately balancing acceptable risks and affordability.

For example, in Turkey, the current legislative framework has several provisions regarding multistakeholder participation in building, planning, and disaster risk reduction. However, in practice these forums have yielded very modest results in creating consensus around planning issues. Following the 1999 earthquake in Kocaeli, the National Earthquake Council was established as an independent body to support a large-scale strategic response to increasing risks. The Council proposed a National Strategy for Disaster Mitigation in 2002 and extended recommendations in 2005. Unfortunately, these reports were not translated into any decisive action agenda.<sup>45</sup>

### BOX 1.3 – Zimbabwe's repeated attempts to improve housing conditions through building standards

Zimbabwe gained its independence in 1980. One year later, the government introduced new building standards with the objective of improving the living standards of the population. This, however, was unrealistic, as the minimum compliance levels were unaffordable and unsustainable for the great majority of the population. The standards were introduced with good intentions but were driven by a rigid central vision that ignored the economics behind their implementation.

That vision was hardly compatible either with local customs or the absorption capacity of the local industry. It introduced changes without any form of consultation with or broad participation of primary stakeholders.

Only when a second review of standards took place in 1992 did regulatory authorities start to support more participatory and diverse programs focused on increasing local capacity and the local relevance of building standards. However, persistent problems with building

standards, planning issues, and corruption have contributed to today's serious shortfall in the construction of affordable housing in Zimbabwe, where a staggering 1.2 million people are now registered on the government's national waiting list for basic shelter.

The case of Zimbabwe underscores the importance of building standards that reflect local building practices and affordability. When standards are set too high, it is impossible for people to comply. Zimbabwe also illustrates the need to replace top-down policy-making processes with participatory approaches. This case demonstrates the necessity of linking the introduction of building regulations with training and capacity building and of linking regulatory reforms to programmatic interventions.

Source: IRIN, March 2013. <http://www.irinnews.org/news/2013/03/08/zimbabwes-urban-housing-crisis>.

Specifically, in the area of standards and building codes, there is a consistent pattern of top-down developments in low- and middle-income countries. Technical experts, frequently driven by the legitimate goal of building by the “best available standards,” hold sway. However, these experts often neglect social and economic considerations and the actual capacity for implementation.

The revision of standards in Indonesia following the 1979 earthquake was consistent with the widespread practice of simply transposing highly sophisticated standards from a high-income country. This transfer failed to recognize the extent to which the borrowed standards incorporate the unique risk patterns, history, building traditions, and economic and social constraints of the originating country. It typically confined this important societal choice to technical experts, who did little to consider the socioeconomic differences between Indonesia and the high-income countries from which the standards were imported. At that time, authorities overlooked the experience of local implementers and overestimated their own capacity to enforce overly ambitious, expensive standards.

### Failure of codes to address locally prevalent non-engineered construction

Building codes transposed from higher-income settings frequently reference technical standards for a limited range of construction materials and methods. Generally, methods and materials indigenous to the borrowing country are not included. However, indigenous construction practices are particularly relevant for low-income populations. Failure to consider improvement of health and safety measures for these construction types relegates them to the vulnerabilities of the informal sector.

Only a minority of established building code systems today are cognizant of this issue. Most of them do not yet offer any adequate range or

“stratification” of technical standards to respond to different levels of sophistication and realities in construction. This problem is particularly evident when examining the absence of more localized technical standards. If established, such standards could support and guide gradual improvements in the vast sector of vernacular and indigenous construction.

In addition, the requirements for professional qualification and licenses are problematic. They tend to be based on professional practice in the developed world and do not entail knowledge of relevant local, vernacular construction. Professional qualification frequently requires a Northern-style education, which rarely considers vernacular construction, even in low-income countries. As a result, young professionals are often wary of vernacular construction because it has not been a subject of their training. Building research, education, and professional licensing must do a better job of understanding, improving, and advancing critical knowledge of vernacular and non-engineered structures.

### Absence of guidance for improved resilience of traditional forms of construction

The majority of building codes in developing countries typically fail to recognize locally available building materials or prevalent forms of vernacular construction, such as adobe and non-engineered construction. (Notable exceptions include the building codes of Peru and Nepal). Such forms of construction typically account for 70 to 80 percent of residential construction in developing countries. With some attention to proven components of good construction practice, vernacular buildings can withstand extreme events and provide their inhabitants with durable shelter.

It is estimated that 30 to 50 percent of the world’s population lives in earth-based constructions. In several developing countries, this type of dwelling

addresses the housing needs of more than 50 percent of the population and at least 20 percent of the urban and suburban populations.<sup>46</sup>

Adobe construction is used and will continue to be used in many seismically active countries, in spite of the fact that poor-quality adobe houses do not perform well in earthquakes. In most countries where adobe is widely used, however, there are no formal building codes or guidelines for adobe construction. This exclusion loses the potential for significant marginal improvement of economically and socially feasible risk reduction. In some countries, such as Argentina and El Salvador, building codes explicitly prohibit adobe construction in urban areas.<sup>47</sup>

By ignoring or even prohibiting the types of construction that low-income groups can afford, codes effectively limit research and development for improving traditional techniques, materials testing, and quality control. Thus these alternative forms of construction remain vulnerable. In turn, this lack of recognition eliminates opportunities for technically informed guidance for owner-builders of traditional structures. In the absence of regulatory recognition, it is increasingly difficult to access finance and insurance for traditional building types.

The failure to address vernacular technologies in building codes has been an impediment to the

understanding and improvement of those building traditions. In some cases, indigenous adaptations have proven resilient to natural hazards. The *dhajji dewari*, a traditional form of timber and masonry infill construction common in Northern Pakistan, has evolved over centuries and exists in similar forms in other earthquake-prone countries. During the 2005 earthquake in Pakistan, most of these structures suffered some damage, but very few collapsed. However, as no code of practice and formal recognition existed for this form of construction, donors were initially reluctant to support the construction of self-built *dhajji dewari* in the aftermath of the disaster.<sup>48</sup>

### Failure of building codes to address the prevalent pattern of incremental construction

Building codes typically fail to recognize the incremental process of construction. Incremental construction refers to the gradual step-by-step process in which owner-builders append or improve building components as funding, time, or materials become available.<sup>49</sup> In many cities of developing countries, this phased process of self-built construction is the dominant pattern of residential construction, accounting for 50 to 90 percent of new housing.<sup>50</sup>



Over the past few decades, governments have experimented with many different approaches to deal with a severe shortage of housing—with mixed results. In Latin America, households that were unable to meet housing needs through formal sector mechanisms typically resorted to informal solutions, specifically by obtaining illegally subdivided lots and constructing their houses incrementally. Without the benefits of health and safety regulation, such informal development continues to account for a major portion of the housing supply in Latin America.<sup>51</sup>

Incremental construction has been accepted in several countries through various approaches within the framework of specific projects, such as core housing. Recent affordable housing strategies have focused on community involvement and on encouraging self-help home building and renovation activities by households in urban settlements. However, the building regulatory process has failed to provide guidance for incremental construction practices or to provide continuing oversight through the extended period of construction.

### Lack of quality control for building materials and equipment

A critical factor in building performance, aside from design and construction practice, is the quality of building materials. Resilient building design is based on assumptions regarding the strength and performance of constituent materials. In order to assure design performance of buildings, materials must be tested and certified as meeting design specifications. Many low- and middle-income countries lack the network of accredited materials testing laboratories necessary to certify the quality of building materials. This testing and certification is particularly important for modern construction materials, such as steel and concrete, and more complex building assemblies. However, materials testing can also be provided for indigenous materials and practices. In the 1970s, India's Central Building Research Institute in Roorkee carried out extensive testing of earthen construction materials and applications as the basis for guidance on non-engineered construction.

A particular problem in the materials testing area is related to the use of reinforced concrete. Reinforced concrete is the principal structural material for urban expansion areas around the world. It allows for the construction of multistory buildings and is deceptively easy to use. The collapse of poor-quality reinforced concrete buildings is one of the principal causes of fatalities in the cities of low- and middle-income countries.

Regulated construction requires that concrete samples from the construction site be tested for actual compressive strength in a certified testing laboratory. Without this testing, the quality of concrete construction varies widely and can result in failure during earthquakes. The “as built” does not always meet the design specification for the material. This was the case in Haiti, where, prior to the 2010 earthquake, there was only one materials testing laboratory, which was unable to provide testing for most of the construction in the country.



The mixing of concrete is very sensitive to the proportion of cement to sand to aggregate and to water. Improper proportions and possible contamination of sand or aggregates with salt or organic material can weaken the concrete product, as can inadequate curing of concrete due to water shortage. The 2011 collapse of the Langata Southern Bypass building in Kenya is largely attributed to the type of sand used, which was quarry dust. Quarry dust, as the name suggests, is very fine and flour-like. It has no bonding capacity and contains many impurities, which lessen the strength of the reinforced concrete. (Conversely, river sand has small sugar-like granules, which provide the necessary friction and tightly hold the concrete to the steel.)

Jamaica illustrates the nature of the challenge. The Jamaica Building Code requires the certification of four key building materials: cement, aggregate, concrete, and concrete masonry units. But the present Jamaica Building Code is 107 years old, dating from 1908, and is a voluntary rather than mandatory code. In Jamaica, cement is usually certified at port of entry. Other materials are not consistently checked, as site inspection is not mandatory and is rare in practice. The provision for certification of building materials exists, but is not enforced and is therefore ineffective. A proposed new Jamaican National Building Code, based on an adaptation of the International Building Code (IBC), would make these provisions mandatory. As in many low- and middle-income countries, standards exist but are not mandatory or implemented.<sup>52</sup>

The Kenya Bureau of Standards (KEBS) has the responsibility of ensuring that the materials used in construction meet required standards. Structural steel and reinforcing bar (“rebar”) are critical to building performance. The structural performance characteristics of steel depend on constituent materials and the fabrication process. Materials

testing can determine the tensile strength or brittleness of steel building components. Without accredited independent testing, there is a risk of using steel that does not meet design specification and may contribute to future building failure. The unfortunate string of building collapses in Kenya (Box 1.1) also reveals deficiencies in both mandating and enforcing these essential tests.

### Limited access to code documents or training for code compliance

Builders and homeowners cannot comply with building codes if they are not familiar with them. This is a recurring challenge with regard to reaching poor and illiterate builders. Literacy levels among homeowners, engineers, architects, politicians, and builders vary enormously, and a distinction must be made between the guidance and support required by the general public (homeowners) and the various categories of professionals.

Building and land use regulatory frameworks are often written in a language that is difficult to understand, particularly for informal builders and low-income homeowners. Regulations must be precise in order to ensure accurate and consistent interpretation in case of litigation. However, compliance cannot be achieved if codes are not translated into layman’s language and if they are not promoted through effective communications tools and awareness mechanisms, targeting both building practitioners and the general public.

## 1.5– Weakness in building code administration and institutional capacity

A fundamental problem in low- and middle-income countries is the lack of funding and support for building regulation at the local level. However, even limited resources can be put to more effective use. Other forces such as opaque governance practices, regulatory capture, and corruption can hold back more immediate common sense solutions and contribute to a significant increase of risks in the built environment.

### Shortage of technically qualified personnel and funding at local and municipal levels

Local governments are responsible for approving development projects and building plans. They are in the front line of risk reduction in planning and building; they must pass bylaws on building regulations and prepare land use plans and emergency response plans. However, many local governments, especially in smaller towns, do not have qualified technical staff.<sup>53</sup>

The extent to which municipal authorities can improve the supply of serviced land and deliver

basic regulatory services is a function of both the pace of development and the country's level of economic development.

Developing countries have, for the most part, been unable to keep up with the demand for serviced land or to provide adequate basic services to residents of their rapidly growing urban centers. Some key obstacles have included shrinking central government transfers, inadequate local tax bases to pay for the delivery of services to a growing population, inadequate institutional capacity to prepare mid- and long-term development strategies, and insufficient funding to implement these strategies.

Few municipalities have complete authority over taxation, and so they struggle to create and sustain the capacity to service land and respond effectively to a growing demand for new construction. Local tax rates are often set by national or regional authorities and, as is the case in the Middle East, North Africa, and West Africa, property taxes may even be collected by a central authority and only partially redistributed to the municipality.<sup>54</sup>

As building stocks in developing countries are projected to double within the next 15 to 20 years, the pressure on local governments and municipal services to fund qualified building

### BOX 1.4 – Illustrating the restrained capacity of Lebanese municipalities to conduct building permit reviews and inspections

Lebanon illustrates the latter case of low municipal capacity, despite acute seismic risks in the country. Municipalities in Lebanon are underresourced and unable to adequately perform their limited role in conducting plan reviews and inspections of construction. The very modest role of municipalities in the building permitting process stems from a decision to centralize responsibilities for building controls within the Urban Planning Offices under the Ministry of Public Works and other central agencies. In Beirut, where the municipal office takes on more responsibility than in smaller municipalities, equipment and resources are very inadequate. Storage facilities for filing and the filing process itself are manual. The official land use plan for the local

district of Beirut dates back to the 1930s and the era of the French mandate.

Because revenues are low, municipalities have difficulty covering expenses related to inspections and are not able to provide adequate salaries to municipal building engineers. This challenge presents opportunities for pooling of human and physical resources—e.g., municipal unions could take on spatial management tasks—as a way of delivering more robust building permit services. These ideas have not yet been implemented, despite prevailing seismic risks in the country.

officials, adequately enforce building codes, and manage risks associated with new construction is only growing.

Many countries and cities fail to make effective use of private sector technical resources to augment governmental regulatory manpower. This failure has constrained regulatory capacity.

The more direct implication of low municipal capacity is that local planning and building agencies are often unable to conduct plan reviews of building projects or to carry out building inspections. Paradoxically, there are cases (for example, transition economies such as Tajikistan, Vietnam, or Ukraine) in which severely constrained regulatory capacity coexists with the execution of extensive untargeted and ineffective building inspections that are not prioritized on risk-based principles. This points to patterns of lack of capacity combined with ineffective use of scarce control resources.

### Corruption in building control functions

Corruption is at the heart of failed regulatory frameworks, as it undermines all aspects of good regulations. Corruption is strongly correlated with

poverty, and in low-income countries it may seem to be an intractable problem for efforts to create a robust environment for building regulatory compliance.<sup>55</sup>

In its various forms, corruption remains an entrenched, man-made failure—one that destabilizes the construction industry, stymies the necessary reforms of building oversight mechanisms, and is a dominant factor in the scale of fatalities in earthquakes.<sup>56</sup> The manifestations of corruption related to the construction sector can be divided in three major categories:

- Corruption linked to government contracts
- Corruption linked to theft
- Corruption linked to circumventing regulations

The evidence suggests that combined, these different streams of corruption lead to poor-quality construction. They also lead to insufficient maintenance, which can significantly reduce the economic return to investments while carrying high human costs in terms of injury and death.<sup>60</sup>

Experience in Latin America also points out that in some instances, opportunistic political figures have facilitated the occupation of hazardous sites and unsafe structures as a populist appeal

**TABLE 1.1—** Overview of corruption types and related activities

Major types of corruption and drivers	Most common activities	Scale of problem and examples
Manipulation of government contracts	Manipulating budget decisions, project selection, tender specification, contract negotiations or renegotiations, and procurement outcomes.	Transparency International points out in its 2011 Bribery Index that “works contracts and construction” ranks the lowest out of 19 different sectors, a score consistent with research outcomes from previous years. <sup>57</sup>
Theft of materials and other assets	Theft of materials and building equipment, especially in relation to public procurement and works.	In Indonesia, a physical audit of a community-driven development program that focused on construction found that an estimated 24 percent of expenditures were lost in materials theft. <sup>58</sup>
Circumvention of regulations	Bribes paid to building officials, inspectors, or engineers delegated by public authorities to carry out appropriate controls. Bribes paid to licensing authorities to obtain a right to practice.	In some countries with corrupt regulatory regimes, the proportion of buildings that collapse due to inadequate inspections is 75 percent on average, and conceivably as high as 95 percent. <sup>59</sup>



to disadvantaged populations. For example, Cerro Norte in Bogota, Colombia, developed mostly as an informal settlement in the 1970s. Subsequently, in the 1980s, politicians lobbied for large-scale regularization programs in exchange for votes, although most of the area was considered vulnerable to floods and landslides.<sup>61</sup>

This report focuses on the third of the three types of corruption identified above.

Consistent sources of data point to the nature and the depth of overwhelming corruption in building controls. The World Bank Enterprise Survey shows that over 30 percent of firms in South Asia and the Middle East are expected to give gifts in exchange for construction permits. In countries such as India, Ukraine, and Yemen, these rates hover in the 60 to 80 percent range.<sup>62</sup>

The 2008 Business Environment and Enterprise Performance Survey (BEEPS) covered almost 12,000 firms in 29 transition economies in southeastern Europe and Central Asia.<sup>63</sup>

The survey suggests that of all administrative transactions, construction permitting is the regulatory area most prone to corruption—more so than meeting with tax inspectors, obtaining an import license, or applying for a water connection.

Corruption in building code enforcement is associated with some of the worst possible disasters. Before the 1999 earthquake in Turkey that killed 17,000 people, 65 percent of apartment blocks in Istanbul and other cities had been built in violation of local housing codes. These structures were built by contractors who skipped soil tests, built extra floors, and ignored specific seismic requirements. Turkey had a building code with sophisticated earthquake-resistant provisions prior to the earthquake. This failure was first and foremost a collapse of the code implementation system. It was partly enabled by widespread petty corruption that incentivized building inspectors

to look the other way and let poor building practices develop on the ground. These factors led a prominent company specializing in risk management and information services to conclude that

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*“almost all of the damage caused by the earthquake, and almost all of the deaths caused by the collapse of inadequately designed and constructed buildings was avoidable.”<sup>64</sup>*

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Recent statistical evidence shows that 83 percent of all deaths from earthquakes in the past three decades have occurred in countries considered most corrupt by Transparency International. The correlation is striking, and shows that the majority of fatalities from earthquakes can be attributed largely to regulatory failure and the effects of corruption.<sup>65</sup>

### Corruption or regulatory capture?

In practice, corruption and regulatory capture can be difficult to differentiate. Regulatory capture occurs when special interests co-opt policy makers, and especially regulatory agencies, to further their own ends. Regulatory agencies eventually come to be dominated by the very industries they were charged with regulating, and eventually to act in ways that benefit those industries rather than the public.

Regulatory capture has been at work in various areas such as transportation, telecommunications, financial services, energy, environmental policy, and construction.

The practical effects of capture in building code implementation can considerably alter regulatory outcomes and lead to unintended consequences, such as:

- Reducing safety standards to benefit the regulated industry;
- Conversely, increasing safety standards to unsustainable or unaffordable levels for local owners and builders;
- Creating unwarranted barriers to entry to protect the regulated industry from competition; and/or
- Stalling reform efforts.

In Jordan, a comprehensive review of building codes in the mid-1990s was driven by parties within the construction industry, consulting firms, and the Engineers’ Association that efficiently lobbied for excessively high factors of safety regardless of affordability and implementation skills. The need to find economically viable solutions was therefore undermined by this effort. The introduction of these new standards created tensions with local engineers, who lacked the technical support to meet new requirements. The sudden change in requirements led to increased construction costs and a professional competency gap that resulted in cases of building collapse.

Regulatory capture can stall necessary and legitimate regulatory reforms. The promising legislation passed by the government of Turkey in the immediate aftermath of the devastating 1999 earthquake introduced significant innovation into building code enforcement with strong potential to reduce risks in new construction. This legislation was opposed by engineers in the public sector who advocated exclusion of public buildings, restricting the legislation to private construction. Shortly after the passage of the decree,<sup>66</sup> other professional interest groups led an opposition campaign against the enactment of more rigorous requirements for professional qualification.<sup>67</sup>

### Defining transparency

*For the purpose of this report, transparency in regulation development means that interested parties have the opportunity to provide their views to government via an open consultation process while the regulation is being developed and after it is implemented. Transparency in regulatory implementation also means that people who must comply with regulations have access to these regulations and can readily understand their requirements.*

## Lack of transparency in design and implementation of regulatory processes

Accountability means that regulatory policy development, administration, and enforcement are subject to public scrutiny so that regulators are accountable for their action.

Reform experience in building oversight procedures in areas such as health, sanitation, and education demonstrates that a commitment to the quality of effective public services is determined by the degree of transparency and the existence of a level playing field for all who need to access information.

Closely related to corruption and capture, a pervasive lack of transparency in regulatory design and implementation repeatedly degrades the quality and impacts of building regulations. Oftentimes, the failure to introduce transparency lies in the protection of a system of “insider trading” and cronyism. In these instances, only insiders have access to good development parcels

or are able to benefit from land value gains where public authorities are investing in infrastructure.

Introducing transparency raises the challenge of keeping these interest groups at arm’s length from building oversight processes. The depth and sustainability of building code compliance is largely determined by the leadership of political and regulatory officials (at both the national and local levels) in addressing the root causes of regulatory capture and obstruction.

In building control procedures, the deliberate choice of not implementing transparent oversight procedures increases the cost of the regulatory approval process. Lack of transparency disengages developers and owners, who will thus continue to be uninformed and unable to submit complete and compliant building project applications. This factor can considerably weaken compliance with land use and building codes.

### BOX 1.5 – Why the success of effective building controls in Trinidad and Tobago hinges on a commitment to transparency

The government of Trinidad and Tobago continues to push for the adoption of the draft Planning and Development of Land Bill, 2001, which includes detailed provisions for land use and construction permitting approvals. The bill proposes cutting-edge innovations in building control procedures.

Among other objectives, the bill seeks to end the bottleneck of permit requests at public building, planning, and permitting agencies while curbing the growth of illegal buildings. To do this, it empowers private “registered professionals” to establish the compliance of building projects with building codes and regulatory requirements from the water and environmental protection agencies.

In order to be effective, it is critical that registered professionals know the approval requirements of various planning agencies. Doing so will allow them to attest to compliance with agency requirements with reasonable certainty. Therefore, each agency should have to make all

its requirements and approval criteria fully transparent and available on its website.

However, this innovative process has been weakened by delays from civil servants in development agencies, who resist transparency by postponing the publication of their specific compliance requirements. With no access to this information, the private sector cannot participate in building controls, and this promising and novel idea cannot be realized.

This example illustrates how emerging economies can be bold in trying to build technically more robust systems of building enforcement. At the same time, it demonstrates how they can fall short of achieving the desired outcomes by failing to address the transparency element attached to any change process. Transparency should be the foundation of a modern and effective policy framework for building controls.

## 1.6– Costly and inefficient building code implementation procedures

In addition to issues with design of legislation and governance, building permitting and inspections procedures frequently raise the cost of compliance for builders to high and unsustainable levels.

Arbitrary and time-consuming building control administrative procedures are often perceived as the strongest disincentives for compliance with building regulations.

### Increased bureaucratic burden does not correlate with more effective inspections

Unnecessarily complex administrative procedures to obtain land titles and building permits contribute to increased construction cost without clear safety improvement. In many countries, the administrative procedures to obtain a formal

building or occupancy permit are so complex, costly, and time-consuming that they inhibit code compliance.

Paradoxically, low enforcement capacity and scarce municipal resources regularly coexist with overelaborated bureaucratic practices, highly restrictive regulations, and redundant inspections. Such patterns are seen in developing countries with a colonial background and in transition economies. Although the failure to inspect has dire consequences, the opposite case of overinspection also yields poor regulatory outcomes.

For example, *Doing Business 2015*'s rankings on construction permit efficiency ranked the Russian Federation 156th, Uzbekistan 149th, and Moldova 175th for the “dealing with construction permits” indicator. In Ukraine, a considerable improvement took place in construction regulations as measured by *Doing Business* over the last two years, but construction-related regulations and enforcement remain very inefficient.

### BOX 1.6 – Tajikistan: So many building inspections, for what result?

In Tajikistan, a country particularly prone to seismic activity, regulatory inspections and enforcement are very strict. Reform efforts have led only to a slight decrease in the percentage of businesses inspected at least once a year—from 99 percent in 2002 and 96 percent in 2005 to 85 percent in 2007. In the construction sector, 100 percent of businesses are inspected at least once a year, regardless of size or risk profile.

Obtaining approval for a construction project is one of the most difficult procedures in the country. In 2007, the process of approval for a small shop required no less than 13 steps. Many of these steps required additional substeps, resulting in an average process duration of 18 months in total. Fire safety inspections—which are among the most frequent types of inspections in the country—consistently cover about half of all businesses, with two visits a year on average.

However, most of these control activities are of little benefit for public safety. In *Doing Business 2015*, Tajikistan ranked 168th out of 189 countries in the “Dealing with construction permits” indicator. Corruption is rife in construction permits and in inspections; over 40 percent of firms reported having to pay a bribe for construction permits in 2007. Many inspections, in fact, appear to be conducted primarily for graft—in

2005, approximately 35 percent of all inspection visits lasted less than 30 minutes, a duration that does not suggest that real regulatory supervision work was actually conducted.

Although inspectors and regulators impose a high administrative burden through multiple and random visits of construction sites, they do not support compliance by educating the public or builders. In the formal building sector, compliance with building code requirements is actually low. Builders are often able to minimize costs by using the high degree of administrative discretion as a tool for evading regulatory requirements.

While, fortunately, no major disaster has recently struck Tajikistan, future events are likely to cause damage given the patterns of seismic risks in the country. Soviet-era construction norms are still in use; though outdated, they should in principle mitigate earthquake consequences if complied with. In reality, however, building practices are often poor, suggesting that builders misunderstand many norms and lack knowledge of technological advances. At the same time, building practices highlight a very intensive yet dysfunctional system of inspections.

This is true, in particular, of fire safety inspections. Over 40 percent of businesses in Ukraine are inspected per year, with two visits on average. The most regularly updated indicator relating to safety of buildings is fire safety, and the aforementioned countries are covered by the international statistical compendium compiled by the International Association of Fire and Rescue Services (CTIF). All rate particularly badly in terms of fire-related deaths per 100,000 inhabitants—9.27 in Russia, 6.82 in Ukraine, 4.22 in Moldova, as compared to an average of less than 1 in 100,000 for most OECD countries.<sup>68</sup>

This data illustrates how countries with very intrusive regulatory systems can still end up with disappointing records on safety.<sup>69</sup>

In Peru, one of the most important procedures to ensure building safety is the system of technical inspections administered by CENEPRED (the National Center for Estimation, Prevention and Reduction of Disaster Risk) and the municipalities. This system is based on comprehensive inspections of a large number of detailed technical specifications, with little attention to systemic issues or risk-based prioritization. In principle, all buildings should be licensed, and every license should require a thorough inspection and be subject to renewal. In practice, a large number of buildings are not considered, or are off the map: their owners simply evade the system and do not apply for a license in the first place. Because the system is based on licensing and not on site inspections, there is no way to detect off-the-map structures. A large share of buildings is never inspected. As for those which are checked, there is ample evidence that overzealous inspection does not necessarily benefit safety. The government is now engaged in a comprehensive reform of the regulatory system, which will introduce a risk-based allocation of inspection resources for a more focused approach to urban safety.<sup>70</sup>



### Opaque language and limited focus on the poor

Oftentimes, information on administrative procedures and compliance requirements for building permits is difficult to access or unintelligible to nonprofessionals. Many builders catering to the housing needs of low-income people are not aware of official building requirements and related procedures. This is due to both their low educational level and their limited interaction with planning and building agencies. In the housing sector, a major constraint is simply the ability of owners and builders to understand and conform to official requirements. In India, Tanzania, and Kenya, for example, planning regulations, standards, and administrative procedures are published in English, even though only a small proportion of the population—and an even smaller proportion of people in low-income segments—can read or speak English.



### Excessive permitting fees

Transaction costs borne by owners and builders for construction permits and inspections continue to be high in proportion to construction costs in developing countries. For example, in South Asia in 2014, it took an average of 14 procedures and 196 days to get a construction permit. Formal permitting fees averaged a staggering 12.8 percent of the overall cost of construction in the region. By comparison, the aggregate regulatory fees paid for planning and construction approvals is equivalent to 1.7 percent of the overall cost of construction in OECD countries. This fee is only 0.6 percent of the construction cost in Japan.<sup>71</sup>

Further illustrating the patterns, in some Middle Eastern, West African, and South Asian countries, high permitting fees have become a de facto backup tax instrument. In Lebanon, failures in land registration and cadastral systems have frequently stymied municipalities in collecting property taxes. As a result, they compensate for losses by charging

very high fees for planning and construction permits, as well as other local licenses.

In Haiti, five years after the devastating earthquake of 2010, building authorities continue to charge developers construction permit fees equivalent to 16 percent of the cost of construction. This cost can be similarly high elsewhere, reaching as high as 20 percent in Madagascar and 25 percent in Serbia. In the city of Mumbai, India, the formal cost of going through a planning and construction permitting process is equivalent to 46 percent<sup>72</sup> of the construction cost, making it practically impossible to comply with prevalent land use and construction permits requirements.

This self-defeating response from local governments has failed to generate more revenues, further undermining compliance with appropriate safety standards and forcing development into the informal sector.

### Failure to mobilize private sector resources for code implementation

Countries that have the least efficient building control procedures as measured by *Doing Business 2015* not only experience the regulatory failures previously described in this chapter; they also have enforcement systems that rely solely on public authorities and municipal building code officials to monitor construction and verify compliance with other applicable laws.

One of the greatest challenges for planning and building code enforcement agencies in developing countries is their capacity to carry out their mandate with extremely scarce resources in ever-expanding and ever-riskier cities. These agencies face severe and growing backlogs in planning and construction approval, inspection, and permitting processes. They also increasingly struggle to attract and retain well-trained and capable engineers and technical staff, given a competing private sector



that often offers better pay and more attractive career prospects.

Reforming countries have seen the limitations of sole reliance on public resources in building code enforcement. Over the past decades, they have pursued different forms of collaboration with private building professionals in code compliance strategies, such as contracting out some control functions and establishing peer-review mechanisms. However, most developing countries have not yet taken this path. They have not tapped into resources of skilled private engineers and building technicians that could be productively associated with more innovative code implementation systems.

In the city of Bamako, Mali, authorities rely on resources located at the Urban Development Ministry for the review of land use and building

permits. This is explained in part by the absence of competent public officials at the “communal” or submunicipal level. As of 2015, there were only four agents in the ministry to handle a city of nearly 2 million people. This is a paradox at a time when private civil engineering expertise abounds in the city, and the national school of engineering of Bamako<sup>73</sup> continues to enjoy a strong reputation at the regional level.

### **Failure to exploit information and communications technology for efficient code implementation**

The potential offered by ICT solutions has been only marginally tapped in the area of building code administration systems, specifically in permitting and inspection procedures.

Judging by an exhaustive measurement of recorded initiatives in the past 10 years (2005-2015), only

19 countries have introduced electronic platforms for building code and permitting administration. Out of 19 countries, two are upper-middle-income countries (Bosnia and Herzegovina, Costa Rica) and only three are low-income countries (Kenya, Nepal, Rwanda).<sup>74</sup> As of today, only two countries in Sub-Saharan Africa have an operating online construction permitting system. Most countries in Central Asia do not have one.

The slow adaptation of ICT solutions for building code administration perpetuates inefficient practices and postpones such advances as easily accessible archives; coordinated inspections; integration of land titling, cadastral, land use, and building information; improved documentation; and effective mechanisms to relay inspection results back to builders and owners.

Although many of these deficiencies can be addressed through legal, regulatory, and process

reforms, information technology has a key role in improving efficiency, transparency, and accountability in building code administration.

The Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP), initiated in 2005 and supported by the World Bank with a \$460 million loan, was a major risk mitigation project established within the Istanbul Governorship Provincial Administration. Component C of the project aimed to improve institutional and technical capacities of building code administration by carrying out a thorough effort at reengineering and automating processes. Illustrating the range of issues at stake, the initial diagnostic carried out by the project team pointed out dysfunctional mechanisms that could be addressed by ICT solutions. Figure 1.2 presents an overview of these issues and how they could best be addressed by ICT.

**FIGURE 1.2** – A range of procedural and administrative challenges for building permits in Turkey at the outset of the ISMEP project

Source: Yelda Kirbay Reis (ISMEP)

Identified Problems	Proposals for Improvement
Lack of monitoring system on work flows in the municipality and between municipality and other public institutions [i.e. Building permit and occupation permit application]	Document Management System [E-Document Management System-TSE 13298]
Lack of capability on reporting information about status of application and public complaints	Document Management System, Call Center, and Service Desk Implementation, e-forms [web]
Lack of digital data accessibility [spatial and non spatial] in the database of municipality	Data [spatial] Collection- Update- Digitalization and Integration Services and Document Management System
Slow and disorganized access to archived documents	Establishing Digital Archive System [scanning-indexing and availability of documents in digital environment by municipal staff]
Lack of backing-up, storing capacity and information security in the municipality	Establishing ISO 27001 information security management system infrastructure and procedures and procurement of disaster recovery systems
Disorganized and non-standard work flows related to land use and building permit procedures in the municipality	Analysis and improvement of work and process flows and formulation of e-forms

### Regulatory resources not allocated in proportion to risk exposure

Many countries have benefited from recent hazard mapping yet still lack the key components of effective regulatory implementation. The zones of the hazard map must be referenced to corresponding and proportionate building requirements, and those requirements must become the basis for design, construction, inspection, and compliance. Without a functioning building regulatory regime, hazard mapping fails to convert scientific knowledge into effective risk reduction measures on the ground.

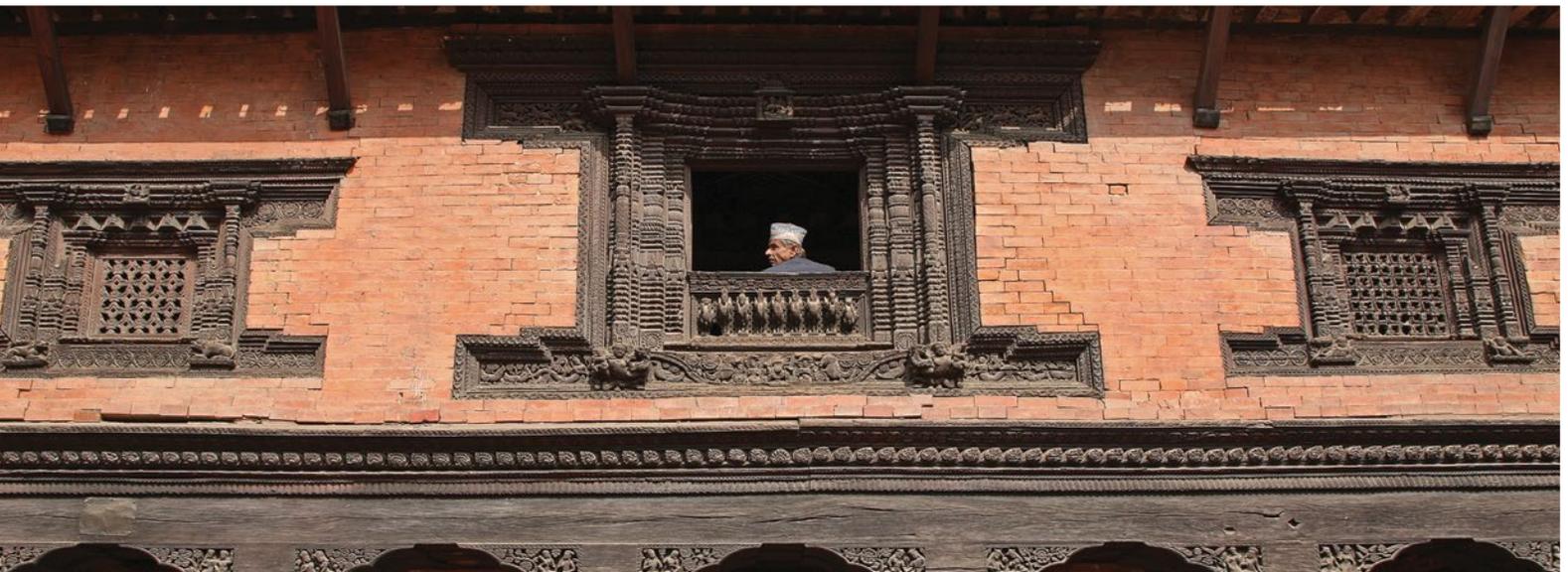
In relation to chronic risks, building codes may fail to provide a building classification based on occupancy or, in terms of natural hazard risk, they may fail to reference maps of geographic and geologic hazards. In the Comoros, Côte d'Ivoire, Lesotho, and Ecuador, codes currently lack a building classification and related design requirements. Thus, building enforcement agencies and builders do not have a common set of references to indicate the appropriate degree and intensity of regulatory controls for the specific class of risk into which the building falls.

### Absence of appeal process for dispute resolution

With regard to land use and building code administrative decisions, the absence of independent professional appeal mechanisms can discourage builders from seeking solutions consistent with legal and technical requirements.

By nature, legislative and regulatory provisions can be open to different interpretations. There is often uncertainty related to administrative or technical regulations. Differences of interpretation among design practitioners and inspectors or permitting agencies can result in costly delays. The absence of appeal bodies with building code and construction expertise can lead to protracted conflicts, stalled permits, and inadequate safety guarantees.

Even where appeal mechanisms are formally in place, they may not be sufficiently established to offer any effective conflict resolution. In most countries of western Sub-Saharan Africa, such as Burkina Faso, Mali, and Senegal, the law has provisions allowing (in theory) the appeal of decisions from the land and building authorities through the formal administrative judicial court system. However, such courts have no particular expertise in dealing with issues in construction. Because of rigid and costly procedural rules imposing multiple audits, resolution can typically drag over 5 to 10 years, making this option impractical and undermining the credibility of the formal process of dispute resolution.



## 1.7– Failure to institutionalize post-disaster regulation

### Missed opportunity to introduce regulatory process for public buildings

Though the unregulated informal sector poses many challenges to public regulators of building and land use, there are opportunities for regulatory intervention in the area of public sector buildings. For instance, school building construction is typically managed by national or local authorities. Management and funding authority reside with governmental entities which should have the opportunity to exercise quality control over the siting, design, and construction of school buildings. School construction offers an opportunity to develop and demonstrate the benefits of building regulation and code compliance. This is an opportunity that has been ignored in many low- and middle-income countries from Haiti to China.

### Inability to take advantage of disaster experience to create permanent building regulatory institutions

In the aftermath of a major disaster, the need to improve construction quality and establish an effective building regulatory mechanism is broadly recognized. Where reconstruction is funded by external agencies, some building standards are often imposed as a condition of funding. There is also sporadic training of local construction workers in improved resilient construction. However, these measures are not sustainable without the institutionalization of a permanent building regulatory authority, one with capacity for effective code implementation and maintenance. The failure to create permanent institutions after a disaster is illustrated by Haiti after its 2010 earthquake (failure to institutionalize regulatory function at the local level), by Nicaragua after its 1972 earthquake (failure to institutionalize building

regulation), and by Barbados after Hurricane Gilbert in 1988 (failure to improve wind design requirements).

## 1.8– Conclusion

The drivers of disaster and chronic risk continue to grow, particularly in low- and middle-income countries. The processes of development drive populations from rural to urban areas, often to hazard-exposed floodplains, coastal areas, or seismic zones. This rapid expansion of urban population is taking place without the benefit of regulation to protect the health, safety, and welfare of new urban dwellers. Unregulated land use allows the settlement of hazardous sites, and unregulated construction allows the creation of vulnerable buildings. Rudimentary regulatory frameworks have been established in many cities of the developing world, but they are currently inefficient and largely ineffective. Weaknesses include incomplete legislative and legal foundations, codes unsuited to local conditions and practices, inept administration of codes at the local level, and failure to train and support the building sector to make code compliance feasible. Efforts to transfer code documents from developed countries have proven unrealistic, inappropriate, and self-defeating. Major obstacles to reducing risk and improving the quality of construction remain: the failure to address and improve local building culture, the failure to establish the legitimacy of the regulatory process through open processes of code development and implementation, and the failure to invest in or support the development of efficient and effective building regulatory capacity. All these have allowed disaster and chronic risk to expand in growing urban areas and have done nothing to address risk in existing vulnerable settlements.



# Components of a Building Regulatory Framework

## 2.1– Overview of regulatory process

Building and land use regulation has been key to successful disaster risk reduction and hazard adaptation in the developed world. Tools for reducing disaster risk and adapting to hazards have been constructed on the foundation of regulatory measures originally established to deal with chronic urban risks related to fire, structural safety, and public health. Over the past century, advances in natural science and engineering have provided the basis for regulation to reduce larger-scale disaster risk.

In the past 10 years, high-income countries with mature building control mechanisms have experienced 47 percent of disasters globally, but they have accounted for only 7 percent of disaster fatalities.<sup>75</sup> The smaller share of human losses in high-income countries is correlated with better

regulatory implementation and compliance to address chronic and acute risks in construction.

Recent reviews of the progress under the HFA have indicated that while developing countries have improved their legislative frameworks for disaster risk reduction, serious challenges remain in implementing effective building regulatory regimes to improve resilience at the municipal and local levels.

The continuing failure of regulatory implementation in low- and middle-income countries has significantly increased disaster risks. This report argues that achieving an effective regulatory framework in developing countries requires a broad participation of technical, financial, and social stakeholders and must take into account the reality on the ground. Implementing good practice should follow a flexible and incremental process consistent with the level of understanding, skills, and income of the various target groups involved in construction.

The purpose of this chapter is to describe the core institutional components of a functioning building regulatory regime. The components and practices described in this chapter are typical of mature regulatory systems that have evolved over an extended period of industrialization and urbanization.

### Key components of an effective building regulatory regime

Three basic components form the core of any building code regulatory regime:

- A legal and administrative framework at the national level;
- A building code development and maintenance process; and
- Implementation of building and land use regulation at the local level.

***A legal and administrative framework at the national level.*** This framework includes the institutions that deliver enabling legislation for the establishment and enforcement of land use and building regulations, including dispute resolution mechanisms. In a broader sense, this component also includes other enabling legislation that supports materials testing and certifications of building professionals and organizations. In higher-income settings, this capacity typically extends to legislation on professional liability and insurance mechanisms. In some cases, and as a result of constitutional arrangements, enabling legislation for building regulation can be organized at the subnational level.

***A building code development and maintenance process.*** This process is essential to set minimum requirements for safe construction of new buildings and retrofit of existing buildings. An open participatory process with representation from all relevant stakeholders is necessary to ensure regulations that represent the values and resources of the relevant community. How a

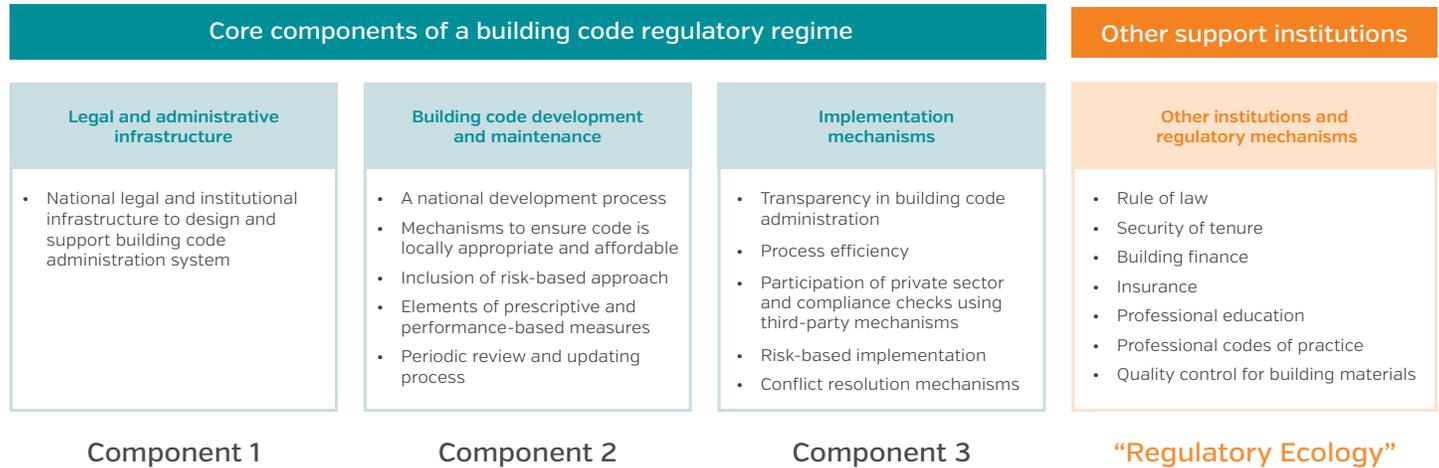
building code is developed and updated (and how stakeholders are consulted in the process) critically determines if a code is feasible in the local context and serves as an effective and affordable tool for risk reduction.

Building code development is usually a process led by authorities at a central level yet typically involves both central and local stakeholders. It is important that codes be developed with reference to local practice and locally available materials and that they allow for innovation and improvement in construction practice. Codes provide an important means to communicate new knowledge to practice. The code development process must enjoy the confidence and understanding of the building sector and the general public.

Oftentimes code development involves a central body that has the capacity to develop a model code. This is then adopted by authorities at the central level or subnational level (state), which has responsibility for local legislation and implementation. These bodies also provide the mechanism for code maintenance and updating. Many codes are model documents developed at a higher level of authority than is responsible for enforcement. But the level responsible for implementation and enforcement is also involved in regulatory development and consultation. Uniform building code provisions at the state or national level contribute to compliance by designers and builders as well as regulatory authorities. To be effective in risk reduction, building codes must be mandatory, and compliance must be feasible.

***Implementation of building and land use regulation.*** Implementation is essential to the actual reduction of risks. Building regulation implementation includes primary activities of preconstruction plan review, on-site building inspection, and permitting. These activities involve

FIGURE 2.1 – Components of a building code regulatory regime



direct interaction with building designers and builders and ensure compliance with promulgated code requirements. This chapter will describe key practices within compliance strategies that seek to improve quality and compliance with basic standards of safety. Building code implementation is, in most cases, a function of the local or municipal government.

### Regulatory ecology: The interdependent institutional context

As used here, “regulatory ecology” refers to the context of the regulatory process within a range of complex interdependent and evolving institutions.

The core components of a building and land use regulatory framework clearly do not function in a vacuum. In the developed world, regulatory capacity has evolved in parallel with a complex mix of supporting tools and institutions that have provided legal and financial mechanisms, as well as certified technical competence, required to deliver regulatory services. Key elements of this regulatory ecology include the general conditions for commercial development, such as rule of law,

security of tenure, and functioning building finance and insurance mechanisms.

Important institutions specific to the building sector include accredited building professional education, professional societies and related codes of practice, accredited training institutions for the construction labor force, licensing procedures for building professionals, and quality control processes for building materials.

This chapter focuses on the code development, maintenance, and implementation processes.

## 2.2– Key components of a building regulatory process

The generic components of a building regulatory regime described above are essential to the reduction of disaster and chronic risk in the built environment. In many low-income countries, these core components do not exist or are highly dysfunctional. In many middle-income countries, these components may formally exist but remain inefficient and ineffective. As a result, risk continues to expand through unsafe construction on unsafe sites.

The specific configuration and location of these components as well as the distribution of responsibility between national and local government and the private sector will vary from country to country. In middle-income countries, the institutions of the regulatory ecology may exist but may not adequately support a robust regulatory function. In low-income countries, the institutions of the regulatory ecology may be absent or largely dysfunctional.

### Legal and administrative capacity

The legislative foundation for a building and land use framework is typically established at the national level. Most countries have basic laws that establish public responsibility to both regulate buildings and establish principles for local implementation and enforcement.

Beyond this basic legislation, a robust legal and administrative component at the national level will typically include the following elements:

- Comprehensive building codes for engineered structures and appropriate guidance on non-engineered construction for builders and owners.
- Programs to institutionalize a regulatory implementation at the local level, particularly in rapidly expanding urban areas. This requires



allocation of resources to train and maintain qualified staff in local governments as well as the promotion of regulatory governance, including transparency and accountability.

- Initiatives to continuously inform, educate, and collaborate with local governments and municipal authorities implementing building and land use regulations.
- Initiatives to support hazard mapping and risk assessment, to evaluate building performance and encourage innovation, to support education and training for building professionals and construction trades, and to support public understanding of the health and safety benefits of regulatory compliance.
- Establishment of minimum qualifications for building professionals, including engineers, architects, planners, contractors, and building

officials. Requirements for professional competency are key to improving the quality and safety of construction.

### Code development and maintenance

Building codes are at the heart of the building regulatory regime. Building codes translate societal values related to public health, safety, and general welfare into specific requirements in prescriptive or performance terms.

Codes establish minimum physical standards for the design, construction, maintenance, and renovation of buildings. Codes communicate both social and technical values (including implicitly acceptable risk) and serve as a mechanism to introduce new social and technical understanding into building practice. As such, building codes

## BOX 2.1 – Establishing minimum qualifications for building professionals

Sustained effort toward developing minimum levels of technical expertise is one of the major factors that contributes to more robust regulatory regimes.

Good practice imposes specific qualification requirements for architects, engineers, building contractors, and building inspectors. These qualifications are often designed and administered by licensing bodies of governments, professional societies, or nongovernmental organizations (NGOs), such as the International Code Council in the U.S. Professional associations of engineers and architects may operate under public right to practice legislation, as in Ontario, Canada, or multistakeholder practitioner boards, such as in the state of Victoria, Australia.

Some regulatory regimes have relied on licensing mechanisms for building professionals. Such mechanisms serve to strategically structure and expand the technical capacity and responsibilities of the professionals. These efforts are important for two reasons.

First, licensing mechanisms can critically contribute to ensuring compliance with building codes and standards. For example, professionals who routinely fail to comply with building codes and standards stand to lose their license to practice or can be disciplined in some other way.

Second, more established professional licensing mechanisms can support increased collaboration between municipalities and private engineers. Contracting out review and inspection activities allows public entities to take advantage of private sector professional capability.

Good-practice licensing programs often expect greater accountability of building professionals and building officials. They tend to be more successful when they establish

- Sound entry-level qualifications based on educational and experience credentials and knowledge of building regulations.
- Training and testing to verify knowledge of local codes and legal context.
- Continuing education to remain up-to-date with changing codes and requirements.
- Mechanisms to prevent licensing from becoming an unfair market entry control tool in the hands of market incumbents.

In some cases, licensing authorities may require building practitioners to carry professional liability insurance, as is now the case in France, Spain, Canada, and Victoria, Australia.

provide a common script for building professionals, owners, and regulators. There have been efforts to introduce developed-country building codes into low- and middle-income countries, but these have met with limited success.

### Characteristics of effective codes

Experience has indicated that there are several basic characteristics of effective codes:

- **Participatory development process:**

The code development process should provide for open participation from the full range of interested stakeholders, including building professionals, developers, and materials manufacturers, as well as representatives of the finance, commercial, and social services sectors. The development of code provisions integrates judgments of acceptable risk and affordability. The process should be based on broad societal consensus. It must also be inclusive of the range of relevant building practices, including the non-engineered construction of the informal sector in addition to sophisticated engineered structures. An open, consensus-based code development process significantly increases acceptance and compliance by the building sector.

- **Comprehensive and inclusive of all aspects of the projects:**

Building and land use regulation were initially developed to deal with a range of chronic hazards including fire, structural collapse, epidemic disease, and public health. In the past century, building codes and land use management have been developed as mitigation or risk reduction measures for natural hazards such as earthquakes, floods, and extreme wind events.

Particularly in urban areas, it is important that building codes address, in an integrated manner, the basic issues of structural integrity; fire safety; electrical, plumbing, and mechanical systems;

and resource efficiency. These aspects of building function immediately benefit building occupants and are as important as disaster risk reduction.

- **Affordability and risk tradeoff:**

Recognizing the tradeoff of safety and affordability, feasible codes must aspire to provide the highest level of amenity and safety that can be achieved with available resources. Unrealistic standards often have the effect of pushing builders into the informal sector, so that the benefits of health and safety regulation are lost. Authorities need to strike the right balance between these competing interests and seek a sustainable compromise through a transparent consultation of a broad range of stakeholders.

Given that the tradeoff between risk and affordability is embedded in code provisions, it is unrealistic to simply transfer codes from one society to another. Judgment of acceptable risk for building failure due to natural hazards is subject to several variables, including the perception of other potential investments in the reduction of other risks or in additional opportunities for social and economic development.

- **Risk-based code development:**

Risk or potential loss is a function of three components: hazard exposure, structure vulnerability, and societal consequences of failure.<sup>76</sup> Risk can be lessened by the reduction of any or all of these three components:

- **Hazard exposure**, usually represented by a reference hazard map
- **Potential structural failure under expected hazard loads**, which is the primary concern of the technical provisions of the building code
- **Social consequences of structural failure**, which are represented by importance factors based on the building function and occupancy.

Although the technical provisions of the building code address acceptable structural performance, the external considerations of hazard environment and social consequences are included in the code in these two ways:

**Hazard mapping for building codes.** The building code specifically addresses the reduction of potential structural failure or irreparable damage. The component of risk represented by natural hazard is typically introduced to the code by a hazard map that differentiates zones of expected hazard impact. Risk maps are available for seismic, flood, coastal storm surge, wind, snow load, and landslide hazards.

Building requirements vary according to estimated expected loads. Adequate hazard mapping for

reference in building code forms an integral part of the regulatory regime for disaster risk reduction. However, these maps are only of value to the extent that they are applied through code implementation and compliance.

**Occupancy type and post-disaster buildings.** Another aspect of risk that building codes address is the consequence of failure of specific structures and occupancy types. Codes typically assign importance factors to specific occupancy classes such as hospitals, schools, fire stations, places of assembly, and so on.

These factors relate to the importance of the facility in the post-disaster period and to the vulnerability of the occupants. Based on the importance factor, building provisions may be

## BOX 2.2 – Building cyclone-resistant housing in Madagascar by linking hazard zoning maps and building code

Madagascar is one of the most exposed countries in the world to cyclone risks, averaging three to four cyclones a year. The 2008 cyclone season, for example, damaged some 6 percent of existing health centers and 4 percent of primary schools, in addition to causing extensive damage to irrigation and transport infrastructure. Many of the structures had already been weakened by poor maintenance and past cyclone damage.

To address cyclone risk, Madagascar's National Unit for the Prevention and Management of Disasters set as its highest priority the development of weather-resistant building and infrastructure codes. The codes were then linked to a national wind map, with design requirements varying according to the design wind speed. The zones define the design wind speed, and the location of the building in a given zone determines the required design.

The Madagascar Meteorological Department developed its wind map based on historical data of cyclone maximum wind speeds for the different zones, and made projections about how climate change would affect the probability of cyclone landfall and wind strength. The latter were derived from an analysis of 10,000 simulated cyclone tracks.

The inclusion of the risk of wind speed occurrence is therefore a part of a risk-based code. The structural requirements of the code are determined by reference to the wind risk map.

The new cyclone-resistant codes were adopted by a government decree signed by all 31 ministries on April 20, 2010, and are based on the codes of Reunion Island and Tonga. The codes are strictest in Zone 1, where they are set to resist wind speeds of 266 kilometers per hour [74 meters per second]. The estimated cost markup relative to a construction standard of 126 kilometers per hour [35 meters per second] in the Highlands is 14 percent. For traditional housing, the additional costs are 24 to 104 percent. The design has been field tested; as a result of the adoption of cyclone-resistant codes by the Development Intervention Fund (FID), only 1 in 1,000 public buildings built by the social fund has been damaged.

Madagascar's new codes are mandatory for public buildings, such as schools and health centers, and are recommended for traditional houses in high-risk areas. They are integrated into the urban and habitat codes. If a public building fails, the decree provides for a public enquiry by local collectivities.

An innovative feature of the new regulation is that it allows for the possibility of civil penalties for both constructors and inspectors in cases of building failure. By making inspection firms co-liable, the new regulation requires certified firms to inspect and confirm compliance. It also discourages unprofessional and corrupt practices.

Sources: Sofia Bettencourt; World Bank 2013.

increased over normal construction to further reduce the likelihood of failure. This reference to risk of hazard impact and to occupancy importance allows the design, construction, and inspection resources to focus on the areas and structures of greatest concern for society. This prioritization of resources is particularly important in low- and middle-income countries.

- **Performance-based codes:**

Building regulations are typically prescriptive; they specifically describe and require the design solution that meets the standard. Prescriptive codes are assumed to meet the intended safety standard and can be easily observed and measured to assure compliance. Prescriptive codes are relatively straightforward and amenable to review and inspection—but they are also restrictive and may inhibit innovation in design and construction.

In response to this limitation, developed countries are moving toward the use of performance codes. Performance codes define the performance objective rather than the specific solution. This means that any solution that meets the performance requirement can be deemed to conform to code.

This flexibility is important to facilitate introduction of new designs, materials, and construction techniques that can meet safety standards more efficiently and cost-effectively.

In low- and middle-income countries, the performance approach may be relevant as a means of recognizing the potential of indigenous building techniques and materials. To the extent that traditional building types can be demonstrated to provide required performance, they can be considered in compliance. This flexibility may be important as an opportunity to improve safety using local materials and building traditions. However, the performance approach requires considerable technical sophistication on the part of designers, builders, and regulators.

- **Code accessibility:**

Code documents should be clear and unambiguous. They should provide adequate guidance to designers and builders to facilitate compliance. Simple and unambiguous code provisions increase the efficiency of compliance, review, and inspection while reducing potential conflicts of interpretation.

Codes should be designed and presented in terms appropriate for the user audiences. Sophisticated modern structures designed by professional

### BOX 2.3 – Obtaining market acceptance of innovations through a performance-based building regulatory framework in South Africa

In the 1940s and 1950s, applications for building approvals were governed largely by local by-laws in South Africa. By the 1960s, standard building regulations had been introduced and were intended to be applied nationally but were not appropriate for all situations and system-built state-funded housing encountered a number of challenges.

Subsequently, the director of the National Building Institute of the Council for Scientific and Industrial Research persuaded the minister of Public Works, whose department was responsible for housing construction, that South Africa should adopt the French system for assessing and approving nonstandardized building and construction products and systems.

This system established performance-based criteria against which the fitness-for-purpose of the product could be assessed. Thus, Agrément South Africa was established. Among other objectives, the authorities charged Agrément South Africa with facilitating the adoption of appropriate innovation in the industry.

The South African regulatory system therefore incorporates both a prescriptive code as well as performance-based provisions that recognize more cost-effective and vernacular forms of construction.

Source: Kraayenbrink 1999.



architects and engineers might require technically complex provisions, while simpler forms of construction using traditional indigenous materials and techniques should be accessible to builders with less advanced technical training.

- **Periodic code review and updating:**

Code documents must be subject to review and updating on a regular basis on a three- to five-year cycle. This regular updating is important as an opportunity to incorporate new knowledge related to experience of building performance and innovations in construction materials and practice. It is also important as a means to adjust to dynamically evolving social and economic conditions in developing countries.

### Key takeaway

The characteristics of effective building codes are as follows:

- They are developed through an open and participatory process that ensures deep and broad expertise as well as a strong buy-in from communities and building practitioners.
- The standards they set are affordable and consistent with local income levels and resources.
- The risk reduction and mitigation measures are consistent with local skills and capabilities.
- They encompass non-engineered forms of construction to support gradual improvements in quality and safety.
- They establish a proportional response to risk through reference to hazard mapping and prioritization of building occupancies.

- They allow for alternative compliance solutions to support innovations or traditional building practices that meet minimum safety requirements.
- They are accessible, clear, and understandable for building practitioners.
- They are regularly updated to reflect incremental progress in surrounding circumstances such as skills development, new technologies and building materials, emerging risks, and evolving income levels.

### Compliance support oriented by plan review, site inspections, and permitting

A typical building code compliance system includes a capacity for building plan reviews, building site inspections, and a permitting mechanism.

For new construction, there are five steps that will guarantee compliance with relevant building standards.

This section briefly describes these five steps and the practices that form the foundations of their effective and efficient implementation.

#### Five generic steps for building compliance assurance

**Submission of a building application to the local authority.** This process usually requires the applicant to disclose information about who will perform the work, what work will be done, where the building will be located, and how it will be built. Sketches, building plans, proof of land rights, and any other relevant documentation of the proposed work must be submitted for review.

**Review process by the local authority.** The building official, or an accredited third-party plan reviewer, determines the project's compliance. This includes evaluating if it adheres to local

planning and land use requirements and construction codes as well as if it meets other requirements set by other public agencies. The reviewing authority or accredited agent is expected to have the basic technical capacity to carry out compliance checks at the design stage.

**Issuance of the building permit.** When compliance with code, zoning, and other applicable regulations is confirmed, the local authority approves the application and issues the permit. A fee is usually collected to cover municipal costs associated with the time spent by the building official in the application process, the technical review of plans, and the various on-site inspections.

**Inspection of construction.** Each major phase of construction can be inspected by the municipality engineers or their private accredited agents in order to make certain that the work conforms to the code, the building permit, and the approved building plans. In New Zealand, the building code for most building types mandates no fewer than seven standard inspections. In other jurisdictions, the decision to carry out an inspection is determined by a risk analysis that includes several criteria, such as the track record of the builder, the type of construction or design, the characteristics of the site, and other factors relevant to a municipal risk assessment. A number of states in Australia and regions in the U.K. follow this approach. They rely on relatively advanced information systems and means of data collection that are not necessarily available in all circumstances.

**Issuance of the occupancy permit.** Many jurisdictions mandate the issuance of occupancy permits following a successful final inspection. The occupancy permit confirms compliance with code requirements, conditions for insurance and financing, and builder liability. Local building authorities usually issue a certificate of occupancy in consultation with other public agencies.

### Five principles of code governance for effective risk management

**Transparency in building code administration** allows for the effective disclosure of critical information on building regulations. This in turn gives building practitioners and owners the tools to both comply with regulations and reduce excessive discretion and compliance costs.



Process efficiency for building permits and inspections minimizes the bureaucracy around building controls as well as reduces the time, number of procedures, and transaction costs needed to gain the necessary approvals.

**Utilization of private sector third-party engineering consultants**—the practice of contracting out regulatory reviews and inspections to certified engineers—supports building code implementation by expanding regulatory capacity in terms of manpower and technical expertise.

**Risk-based implementation** ensures a targeted use of code review and inspection capacity on structures that pose higher risks for their occupants and the community.

**Conflict resolution mechanisms** provide remedies for persons or firms that can be adversely affected by permitting authorities.

### *Transparency in building code administration*

At the code development stage, transparency means that interested parties have the opportunity to participate in an open consultative process oriented toward consensus.

At the implementation stage, transparency means that owners and builders who must comply with regulation have access to the regulation and can readily understand its requirements.

Practically defined, a commitment to transparency is typically reflected by

- Making land use plans available to all citizens and placing them online.
- Developing process maps or guidelines for the entire construction permitting process.
- Providing clear guidelines on complete construction permit application requirements.

Enhanced transparency can draw attention to corrupt and opaque regulation or practices and shed light on inefficiencies, thereby encouraging

reform and modernization. A commitment to transparency involves disclosing easy-to-access, clear, and accurate information. When applied to building code implementation, transparency is considerably enhanced through the following generic practices.

### Components of transparency in building code implementation:

- Available guidelines and checklists covering requirements from all regulatory agencies with different mandates
- Regulations in plain language
- Regulations supported by user-friendly construction guides with illustrations and examples
- Requirements for “complete permit applications” that are clearly defined
- Construction permit application forms that use plain language and are standardized
- Permit applications and associated documentation and plans that can be submitted electronically
- Application status and location available to track online

### Process efficiency and low transaction costs for building permits and inspections

Added costs of code compliance are largely a consequence of increased design requirements included in technical standards referenced by building codes.

Regulatory process costs, which cover review, inspection, and approval processes, include

- Formal fees imposed by approval authorities, and
- “Opportunity costs” associated with complex, lengthy permitting procedures and the resulting delays in making the building available for its final intended use.

Since 2014, *Doing Business* has measured the cost of land use, building permitting, and inspections

as a percentage of the total investment cost in the building. The report found that this cost is on average only 1.7 percent in OECD countries and rarely exceeds 3 percent in countries with advanced building code systems associated with a high degree of regulatory compliance. For example, as measured by *Doing Business 2014*, the cost of regulatory compliance in Japan, New Zealand, and Chile was less than 0.7 percent in each country.<sup>77</sup>

Maintaining transaction costs of building code implementation below the above thresholds is associated with permanent or institutionalized practices, including

- **A transparent regulatory system.** Easy access to accurate and clear information on regulatory requirements from various approval agencies and building code officials will reduce opportunity costs typically experienced with more complex and opaque procedures.
- **A continuous, institutionalized process of streamlining and modernizing permitting and inspections procedures.** In many jurisdictions, the legislation specifically requires compliance with a wide array of other laws related to environmental standards, land use planning, national heritage, and so on, in addition to building code requirements. Streamlining the procedures and placing them online can contribute, on average, to a reduction of 37 percent of the time required to issue a building permit, according to the U.S. Center for Digital Government.
- **The “one-stop-shop” role of the main building code official or “chief building” official.** In best-practice jurisdictions, chief building officers are not only responsible for confirming compliance with regulations administered by the municipal building authority; they are also empowered to confirm compliance with other agency requirements or other “applicable laws.”<sup>78</sup> Given the extent to which building officials rely on

information from other applicable law agencies to assess and confirm compliance, other agencies should demonstrate that they are transparent with respect to their requirements and decision-making criteria.

- **Time frames for the review of building permit applications.** In conjunction with greater transparency, time frames for permit reviews help to limit corruption and increase efficiency. Time frames typically vary according to the complexity of the application.
- **Fee levels that are based on cost recovery.** Fees should be based on the actual costs associated with the review of building plans and site inspection, including overhead costs. Appropriate fees charged for construction permitting and building inspection are intended to cover the costs of regulatory services and not to subsidize other municipal functions.

#### Key takeaway

- Practices that enable efficient implementation procedures with lower compliance costs include
- Transparent and easy access to maps and regulatory information for applicants and chief building officials.
- Streamlined permitting and inspections procedures combined with ICT solutions.
- Chief building official's comprehensive role.
- Established time frames for the review of building permit applications.
- Fee levels that are based on cost recovery and do not fulfill a property tax purpose.

#### Utilization of private sector in compliance checks

Private engineering and architectural firms certified by the public building regulatory department provide third-party reviews. Reviews and inspections are carried out by professionals who have been certified in specific areas of competency.

Third-party review and inspection is particularly valuable as it effectively expands both the quantity and quality of regulatory manpower. Special inspections for highly specialized buildings or building components can also be carried out by independent inspectors to supplement the technical capacity of building department staff.

Over the past 20 years, a stronger focus on risks has been associated with a parallel effort to seek a significantly larger role for private sector expertise in regulatory compliance strategies. This has offered a source of innovative experience in building control, with useful experience emerging in high-income countries, transitional economies, and middle-income countries.

This consistent trend across countries is such that the use of the private sector in compliance checks is already institutionalized in countries as diverse as Colombia, the former Yugoslav Republic of Macedonia, Greece, the Arab Republic of Egypt, Russia, and the Philippines. Driving this shift is the realization that building code implementation can be maximized by adding external resources and critical capacity to resource-constrained municipalities.

Private sector participation in building controls can follow different models of collaboration. It can consist of private sector engineers being delegated by local authorities to carry out third-party plan reviews and inspections (as in Germany and Austria). Alternatively, builders in some jurisdictions can directly retain approved private independent engineers to review construction plans and inspect buildings during construction (as in the United Kingdom).

The latter model involves builders directly hiring a private accredited inspection firm. In the United Kingdom, Approved Inspectors are registered and supervised by an autonomous body. Approved Inspectors typically review and inspect all aspects of construction. They can inspect work, and issue

plan certificates confirming that building plans comply with the building code, but only for the types of buildings for which they are approved and registered.

The third model is less widespread and is associated with an insurance-driven regulatory regime in which insurance and warranty firms engage private inspection firms for third-party review. This approach is in place in France and is being gradually implemented in Spain and Italy. It is relevant to upper-middle-income countries with a preexisting insurance market.

All three models point to innovative ways of bringing new expertise into risk reduction without necessarily relying solely on what may be limited municipal technical resources.

In Austria and Quebec, Canada, the utilization of private sector technical capacity relies more heavily on designer and contractor licensing with less emphasis on third-party audits by municipal or private inspectors. This approach provides an even greater opportunity to engage the private sector. This practice transfers a greater portion of compliance responsibility to the designer and builder.

### Key takeaway

Private sector solutions for building code implementation

- Can help municipalities refocus on risks by bringing in relevant and more robust expertise.
- Can substantially alleviate the pressure on public enforcement.
- Are increasingly considered and tested in emerging economies and lower-income settings to deal with critical institutional bottlenecks.
- Must be supported by some institutional arrangements to ensure relevant qualifications, avoid conflicts of interest, and ensure minimal supervision by independent or state authorities.
- Follow different modalities and forms of collaboration that can be chosen based on the country or city circumstances.

### Risk-based implementation

Allocating regulatory resources to maximize risk reduction provides a rational basis for efficiently and effectively prioritizing inspections in proportion to risk. This approach is particularly important for municipalities and building control agencies in developing countries that operate with limited funding and must deal with rapidly expanding building inventories.

The benefits of risk-based building permitting and inspections include

- Achieving a proportionate and consistent approach for plan review and inspection of buildings.
- Enabling local authorities to focus resources on higher-risk building projects.
- Providing authorities with opportunities for process simplification, specifically for construction that presents lower risk in the local context.
- Enabling authorities to focus on builders with a history of noncompliance.
- Shifting the risk, responsibility, and liability back to the design sector, in which private designers and engineers have the skills, competencies, and experience to function without controls or with limited controls.
- Reducing regulatory demands on builders responsible for construction projects placed in lower-risk categories.
- Contributing to lower cost of compliance, from the perspective of both regulators and those regulated.

### Applying risk management to construction permit and inspections

As of 2014, the World Bank counted 88 countries that have, based on risk exposure, implemented simple and fast-track procedures for processing permits for commercial buildings of less than

1,000 square meters.<sup>79</sup> Most of these reforms were implemented in developing countries, often catalyzed by the publication of the *Doing Business* report.<sup>80</sup>

In a bold reform initiated in 2011, FYR Macedonia developed a risk-based system linking a new classification of buildings with building professional classes, allowing designers and contractors licensed in only the top qualification class to handle the more complex and higher-risk classes of buildings. Not only has this approach been instrumental in reducing state controls, but it has increased transparency and promoted more consistent implementation of building regulations.<sup>81</sup>

Introducing risk-based mechanisms in construction permitting and inspections creates tangible opportunities to initiate more in-depth administrative simplification programs with the aim of using resources more selectively and reducing the administrative cost of compliance.

#### **Conflict resolution mechanisms**

Conflict resolution provides remedies for persons or firms that can be adversely affected by permitting authorities. These mechanisms promote transparency and a level playing field by addressing issues ranging from the interpretation of technical requirements, to sufficiency of building code design and compliance, to licensing of building professionals. Conflict and appeal mechanisms typically have a majority of legally qualified specialists presiding over them to ensure that due process is followed in a swift and efficient manner.

## **2.3– Regulatory ecology: The interdependent institutional context**

The effectiveness and efficiency of building and land use regulation depend on a broader institutional context, referred to as regulatory ecology. In the developed world, regulatory capacity has evolved in parallel with a complex array of supporting and interrelated institutions.

Successful regulatory regimes are closely related to the legal and financial mechanisms of the surrounding economy. A safer built environment depends on general rule of law and public acceptance of public authority to manage collective risk. Compliance with public regulation depends on public trust of municipal authorities. Financial mechanisms, such as mortgage lending and insurance, play a critical role in facilitating improved construction by funding compliant construction over time, while also quantifying and monetizing risk for a number of hazards.

More particular to the building sector are a range of institutions that contribute directly to both the improvement of quality in construction and the reduction of disaster and chronic risk. In the areas of education and training, there exist professional and workforce training institutions and bodies that accredit those institutions. There is an array of standards-setting organizations related to all aspects of building equipment and building processes that provide reference standards for the building codes. Materials testing laboratories exist to certify the quality of building materials and assemblies.

The intricate interplay of legal liability, financial risk management, and insurance underwriting serves to reinforce the regulatory process to ensure a safer built environment. Though the focus of

this report is on the necessary formation of the core components of the regulatory framework, parallel development and investment must advance in these interdependent institutions of the regulatory ecology.

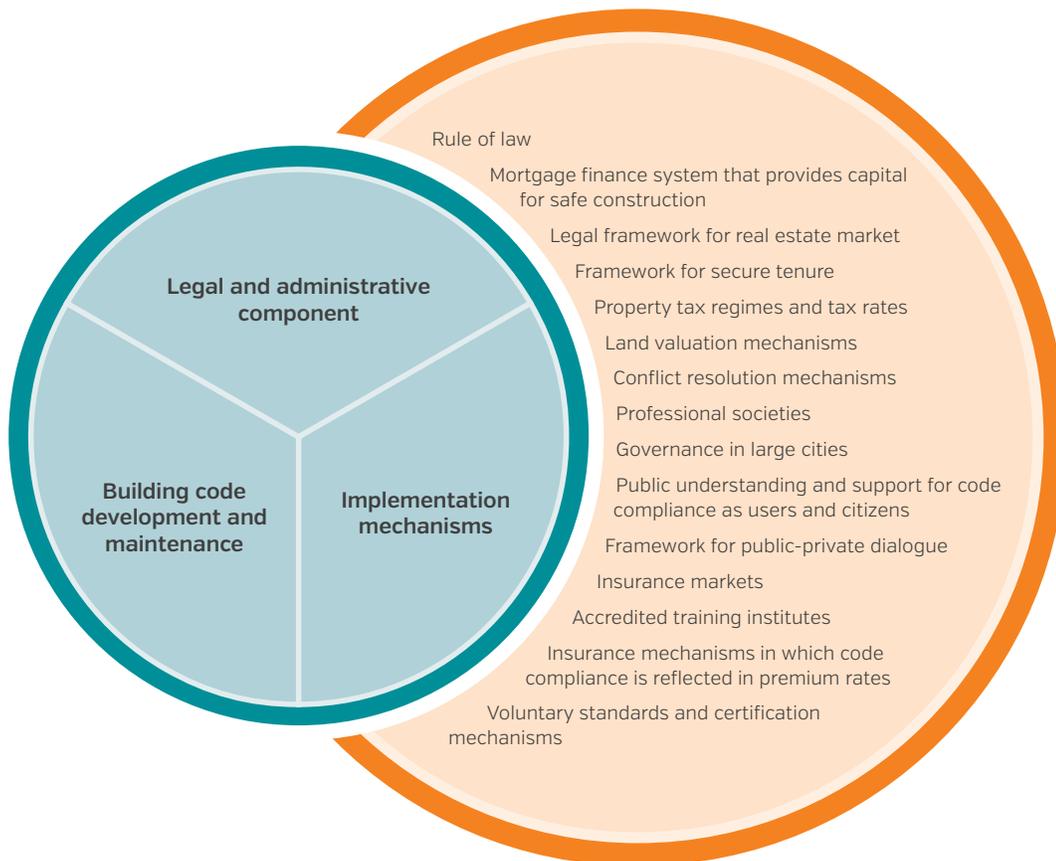
Selected key elements of this regulatory ecology for the built environment include

**The rule of law.** Building and land use regulation are the base legal mechanisms to protect public health, safety, and general welfare in the built environment. Regulation for public benefit can only deliver in a functioning legal environment, in which rules are respected and compliance can be enforced.

**Security of tenure.** Confidence in rights of ownership of land and built assets is a necessary precondition for interest and investment in building quality and resilience. Security of tenure clearly depends on the rule of law.

**Building finance.** To the extent that safe construction may require increased initial funding, mortgage and construction lending institutions play a key role in facilitating code compliance and can stimulate retrofitting. Availability of building finance also provides an alternative to unsafe incremental construction. Building finance depends on security of tenure and ultimately the rule of law.

**FIGURE 2.2 –** Regulatory ecology and core system elements



### BOX 2.4 – The Code of Ethics and Professional Conduct of the American Institute of Architects (AIA)

The AIA Code of Ethics exemplifies the self-regulation that characterizes many of the building sector's professional societies. The preamble to the AIA's Code of Ethics describes the principles upon which the Code of Ethics is based and stipulates that AIA members are dedicated to the highest standards of professionalism, integrity, and competence. This code itself includes guidelines for the conduct of members in fulfilling those obligations.

The code is arranged in three tiers of statements: canons, ethical standards, and rules of conduct.

- Canons are broad principles of conduct.
- Ethical standards are more specific goals toward which members should aspire in professional performance and behavior.
- Rules of conduct are mandatory; violation of a rule is grounds for disciplinary action by the Institute.

Commentary is provided for some of the rules of conduct and is meant to clarify or elaborate the intent of a rule. The code applies

to the professional activities of all AIA members regardless of their membership category and is enforced by the National Ethics Council (NEC).

The NEC comprises seven members of the Institute who are appointed by the AIA's Board of Directors. The NEC's decisions may be appealed to the Institute's Executive Committee; if the NEC recommends termination, the decision is automatically appealed to the AIA's Board of Directors. In addition to enforcing the code, the NEC also proposes revisions to the Code of Ethics and to the NEC's Rules of Procedure.

As part of its efforts to educate members about their obligations under the Code of Ethics, to support AIA component executives, and to inform the general public about ethical issues that arise in the fields of architecture and design, the NEC conducts educational programs on ethics at the AIA's convention, the Institute's annual grassroots conference for component executives, and at various other seminars and programs hosted by AIA components.

*Source:* American Institute of Architects.



**Professional education.** Safe and resilient construction requires safe siting by planners aware of hazards, and safe design by architects and engineers aware of safe design principles. It also requires building officials with full understanding of code provisions. These essential built-environment professionals must be adequately trained in accredited institutions and individually licensed on the basis of tested technical competence. Their certified professional competence is critically important in the complex physical environment of rapidly expanding urban areas. Professional accreditation, certification, and licensing are all important aspects of the rule of law and can be reinforced by requirements related to building finance and insurance. Defining professional qualifications requires in-depth consultations with design professionals in order to develop practical and feasible requirements for minimum qualifications at various professional levels.

**Professional codes of practice.** Professional societies of the building sector in developed countries have taken responsibility for self-regulation of their members' professional conduct, both by developing codes of professional practice and by helping to maintain codes and standards of institutional accreditation. Professional societies play an important role in supporting effective building and land use regulation in most developed countries.

**Training for construction industry and labor force.** All members of the construction industry—not just design and construction professionals—must understand, accept, and abide by building codes and standards. It is critical that construction detailing be executed correctly and that construction materials be understood and correctly applied. This is particularly important for reinforced concrete and other nontraditional materials.

**Quality control for building materials.** Quality control of materials is essential in modern construction. The integrity of a structure depends on the quality of its materials and the method of their preparation. Testing and certification of building materials and components by accredited laboratories is necessary for safe modern construction.

**Accredited training institutions.** Accredited training institutions provide specific training for various practitioners, including public and private building inspectors, engineers, architects, contractors, and builders. Many municipalities also require specific training for the key functions of the building department.

Training institutions provide a way to transfer knowledge and—when attached to mandatory training, qualification, or even licensing requirements—can improve compliance and efficiency. More qualified designers, contractors, and inspectors are better able to evaluate alternative, vernacular, or innovative building approaches because they have a better understanding of building science and regulatory procedure. A balanced ecology involves training institutions that are not limited to academic institutions. The private sector should be engaged in developing a robust on-the-job training system that does not present a disproportionately high barrier to entry for practitioners.

**Insurance.** The insurance industry has played an important role in the historical development of building regulation as a means to manage risk and exposure in many developed countries. Insurance is based on the quantification and translation of risk into monetary premiums that are comprehended by building owners as the present and recurring cost of risk.

### BOX 2.5 – Accreditation of building regulatory agencies

The International Accreditation Service (IAS) of the International Code Council provides an evaluation service for the accreditation of local building departments. Evaluations are based on analysis of staff training and technical qualifications, plan review and site inspection practice, customer service, and administrative efficiency. This accreditation process provides a valuable external review and evaluation of regulatory efficiency and effectiveness. The accreditation process informs the building department of areas

of deficiency and provides a benchmark for quality of service. IAS accreditation is not only a credit to the municipal government; it also shows the business community and general public that the building department is functioning at a high level of competence and is worthy of support and cooperation. Public confidence in regulatory agencies is essential to code compliance. This service is provided by an independent, nongovernmental, nonprofit organization representing building departments and officials from across the country.

Typically, building finance requires insurance to cover real estate investments. The insurance companies, in turn, require code compliance, professional certification, and material quality control. Effective regulation is a requirement for insurance underwriting. Beyond property and casualty insurance, professional liability insurance plays an important role in regulating the qualifications and performance of designers and contractors. The insurance mechanism reinforces the academic accreditation and public licensing for building professionals.

The insurance industry is in the business of quantifying risk and estimating premiums that cover losses and produce profit. This incentive has supported the development of tools for evaluating

risk factors and estimating probable losses. The Insurance Services Office (ISO) has in the past developed tools for estimating community fire risk based on construction, firefighting capability, and water supply. These evaluated variables are used to develop a community index, which insurers then use to establish premium rates for fire insurance in the community.

In an extension of this concept, the ISO has developed the Building Code Effectiveness Grading Schedule (BCEGS). This methodology evaluates building department effectiveness in code compliance related to natural hazard vulnerability in the community. The resulting index is used by insurers to determine premium rates for natural hazard insurance.

### **BOX 2.6** – The French mandatory liability insurance system: a main driver of compliance with building standards

In France, builders are liable to the owner for any damage revealed within 10 years which renders all or part of the building defective or unsafe. This 10-year liability provision provides joint liability for builders and manufacturers, thus shortening and simplifying the process of identifying who is liable for the cost of repair. In this way, any key player involved in the construction can be held liable for the entire cost of the repairs. In the meantime, the cause of the damage can be investigated. A 10-year liability is presumed and applies to any damage that compromises the integrity of the structure or that affects essential elements of the building, rendering it unsuitable for its intended use.

Nearly all actors involved in the building process, apart from the owner, are subject to such liability, and so is the seller of the building after completion. The idea is that whoever creates a problem must pay compensation. Because the 10-year liability is mandated by law, no contractual clause may depart from it.

The mandatory insurance requirement applies to any work on a building and to the various actors involved in the building process. Both the owner and the builder must take out insurance.

The owner's insurance covers against all damages to the building. The insurer compensates the owner before any research on liability

is initiated for any damage (or any risk of damage) occurring within the 10-year period. The builder's insurance covers the 10-year liability period. Provided the builder has complied with state-of-the-art standards, referred to as "DTUs," insurance companies will cover the repair costs for any serious damage.

The mandatory insurance regime has led to a shift of power and workload toward insurance companies. With the exception of submitting a claim, the process requires no other intervention by the owner. A court process is seldom needed because insurance companies mostly resolve claims directly between themselves. As a result, delays in receiving compensation are short in most cases. Complaints are submitted to courts only if the conflict cannot be resolved at the insurance level, creating fewer costs for the state.

Due to the mandatory insurance system, insurance companies have a significant influence on the content of building contracts and on the techniques and products used during the building process. By making DTUs mandatory, insurance companies act as an actual enforcer of building standards. Moreover, by allowing a fast and adequate compensation of any damage, the system protects the owner and the user of the building.

## 2.4– Conclusion

The core components and supporting institutions for a building and land use regulatory framework are fundamental to disaster and chronic risk reduction in new and existing settlements. They constitute the critical link between theoretical scientific understanding of hazards, engineering understanding of building performance, and the necessary change in building practice to reduce disaster risk.

Investments in hazard mapping and engineering mitigation measures have no impact on risk without implementation in building practice. To date, this link to practice has been missing in most low- and middle-income countries. Experience from developed countries has demonstrated the necessity of the three core components:

1. A legal and administrative framework
2. Inclusive and locally appropriate code development, maintenance, and dissemination process
3. Effective and efficient compliance support through plan review, site inspection, and permitting

Initial efforts in Nepal, Madagascar, Pakistan, and Turkey have demonstrated effective means to support the development of these core components and to advance the key supporting institutions.

Established building and land use regimes in developed countries have demonstrated success in reducing disaster and chronic risk, particularly in terms of life loss. Once established, the core components and supporting institutions will likely follow a locally defined evolutionary path of growth in capacity, as has been the case with regulatory capacity in developed countries.

### BOX 2.7 – Building code effectiveness and insurance

The Insurance Services Office (ISO) Building Code Effectiveness Grading Schedule (BCEGS) assesses building codes that are in effect in a particular community as well as how the community enforces its building codes. Special emphasis is placed on mitigation of losses from natural hazards.

The concept is simple: municipalities with well-enforced, up-to-date codes should demonstrate better loss experience, and insurance rates can reflect that. The prospect of lessening disaster-related damage and ultimately lowering insurance costs provides an incentive for communities to enforce their building codes rigorously—especially as they relate to windstorm and earthquake damage.

The anticipated consequences include safer buildings, less damage, and lower insured losses from disasters.

The BCEGS program assigns each municipality a BCEGS grade between 1 [exemplary commitment to building code enforcement] and 10. The ISO develops advisory rating credits that apply to ranges of BCEGS classifications (1, 3, 4, 7, 8, 9, 10). The ISO gives insurers BCEGS classifications, advisory credits, and related underwriting information on which to base insurance premiums.

The program was first implemented in U.S. states with high exposure to wind (hurricane) hazards before it was expanded to states with high seismic exposure.

BCEGS is similar in concept to the ISO's Public Protection Classification evaluations of municipal fire suppression capabilities that insurers in the United States have used for decades.

*Source:* Insurance Services Office.



# Making Building Regulation Work for Disaster Risk Reduction in Low- and Middle-Income Countries

## 3.1– Drivers of compliance and principles of regulatory practice

### Drivers of regulatory compliance

The goal of building regulation is to reduce health and safety risk by implementing and obtaining compliance with technically competent, socially acceptable building codes. In reality, however, locales sometimes draft and adopt regulations without considering how likely or feasible compliance will be.

Behavioral drivers of regulatory compliance have been observed in a range of circumstances as diverse as food safety and tax administration. What are these drivers? A widespread view underpinning the design of regulations is that people comply with rules only if there is a threat of serious consequences for compliance evasion. This model

suggests the need for aggressive supervision and punishment for violations. It requires more inspections and tougher enforcement. Individuals are assumed to be rational calculators, only motivated to comply if the costs of noncompliance are high and punishment is highly probable.

This view rests on a pessimistic perception of human nature, not on research or statistical evidence. This perspective of compliance motivation is consistent with neoclassical economic theory<sup>82</sup> in which agents comply based on rational choice to maximize expected utility. They weigh the costs of compliance against the potential gains of noncompliance, minus the costs of possible sanctions multiplied by the probability of detection.<sup>83</sup> Consistent experience from other regulatory fields suggests that this is not the case.

*This chapter presents specific recommendations for development of building regulatory capacity and compliance for health, safety, and disaster risk reduction in low- and middle-income countries. The chapter outlines a regulatory reform agenda to guide those dedicated to disaster risk reduction.*

*The agenda for improved regulatory implementation is prefaced by a discussion of factors influencing the compliance with code that is fundamental to risk reduction. The agenda then presents specific reform initiatives that address the problems identified and elaborated in Chapter 1.*

### **Punishment alone does not achieve compliance or risk reduction**

Unsurprisingly, studies show that threats of punishment are a driver of compliance, but not a decisive one, as dissuasion effects do not always lead to desired behaviors.<sup>84</sup>

Compliance driven by threats and deterrence is expensive. In practice, effective deterrence requires funding the expansion of costly enforcement systems. Systems that rely entirely on dissuasion also risk intruding on privacy and individual freedoms, which may undermine regulatory legitimacy. Deterrence is important but can best be seen as one of the necessary ingredients of the compliance system, or as one that should be considered in combination with positive support to achieve compliance.

### **Procedural justice and legitimacy foster compliance**

Research has consistently shown that the degree to which regulated subjects find authorities and rules legitimate is one of the strongest drivers of compliance. Provisions for open participation and fairness in the regulatory process, often referred to as “procedural justice,” are the foundation of legitimacy and the most important driver of voluntary compliance.

Key elements of procedural justice are fairness of interpersonal treatment and behavior by authorities that fosters trust and gives stakeholders a real voice in the process. In practical terms, it means treating people respectfully, demonstrating ethical behavior, and self-imposing limits on discretionary power. It also means demonstrating that regulated subjects are listened to and that their arguments, issues, and requests are carefully considered. This approach does not necessarily lead to decision making that corresponds to the regulated subjects’ requests or desires, but it demonstrates that their concerns are taken into account to the extent possible.

The procedural justice effects are found in many fields and settings.<sup>85</sup> A major benefit of this approach is that it helps in developing long-term, self-sustaining drivers of compliance—and in reducing the need to increase a more traditional and costly type of police enforcement.

In the words of Tom Tyler, the key conditions needed to achieve a procedural justice effect are these:

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*“Decision-making is viewed as being neutral, consistent, rule-based, and without bias; . . . people are treated with dignity and respect and their rights are acknowledged; and . . . they have an opportunity to participate in the situation by explaining their perspective and indicating their views about how problems should be resolved.”<sup>86</sup>*

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### **Designing regulatory processes to support compliance**

Exclusive reliance on aggressive enforcement may hinder compliance, especially when enforcement involves abusive arbitrary discretion, lack of transparency, disrespectful treatment, excessive bureaucracy, and refusal to consider appeals.

For example, oppressive tax enforcement and harassment of taxpayers seem to increase tax resistance, as does discontent with the delivery of public services.<sup>87</sup>

In conclusion, regulatory and governance reforms should be based on a balanced approach between punitive enforcement and compliance support with procedural fairness. In this spirit, the following sections present specific interventions that can enhance the legitimacy of the building code process and the effectiveness of code compliance.



### Principles of regulatory practice

The World Bank, the OECD, and the U.K.-based Better Regulation Delivery Office<sup>88</sup> agree that regulators should not simply emphasize police enforcement, but also provide clear information, guidance, and education to those who must comply. They stress that regulators should find straightforward ways to collaborate and engage with those they regulate in order to hear their views.

Building on the premise that procedural fairness is an important driver of regulatory compliance, a

growing consensus on core principles defines “good regulatory practice” as follows:

- **Effectiveness.** Effective regulation achieves its objectives (in this case, improved health and safety and reduced disaster and chronic risk).
- **Efficiency.** Efficient regulation achieves its beneficial objectives at the lowest cost in terms of building cost, construction time, and long-term maintenance. Aggregate benefits, including intangibles such as safety and security, must exceed aggregate costs.
- **Transparency, openness, and accountability.** In the development of regulations, interested parties have the opportunity to provide their

views to government via an open consultation process. Transparency in regulatory implementation means that regulatory provisions are unambiguous and readily available to the public. Accountability means that regulatory policy development, administration, and enforcement are subject to public scrutiny. Regulators are held accountable for their actions and mechanisms for dispute resolution are provided.

- **Proportionality.** The stringency and compliance cost of regulatory provisions should be balanced with the risks and potential losses that they address.
- **Consistency.** Coordination and consistency between regulatory requirements is essential. Provisions for various aspects of a building cannot be in conflict (that is, structural, plumbing, electrical, and energy codes), nor can building regulations contradict the requirements related to environmental protection or historic preservation.
- **Innovation.** Building codes should not inhibit the advancement of building technology or practice through narrowly prescriptive requirements. Codes must accommodate and advance innovation and improvement in both building practice and regulatory practice.

These core principles are not always mutually reinforcing. For example, an effective regulatory practice may result in high levels of compliance at the expense of efficiency. Conversely, an excessive focus on efficiency and rapid processing of reviews, inspections, and approvals can result in lower levels of compliance and safety.

The balanced pursuit of these principles that underpin good regulatory governance requires an open process based on fairness and broad participation of all legitimate stakeholders in the building process.

## 3.2– Agenda to strengthen regulatory implementation in low- and middle-income countries

### Ensuring the safety of new construction and reducing the risk of existing vulnerable settlements

The two primary priorities of this report's recommendations are

- to stop the expansion of disaster and chronic risk in the siting and construction of new settlements; and
- to reduce disaster risk in vulnerable existing settlements.

New construction with appropriate design can be made disaster-resistant for a small percentage of construction cost, on the order of 5 to 10 percent,<sup>89</sup> whereas the retrofit of existing vulnerable structures may require major expenditure, in the range of 10 to 50 percent of building value.<sup>90</sup>

Establishing standards and implementation mechanisms for new construction can provide the institutional and technical foundation from which to address the residual disaster risk in existing vulnerable settlements.

The massive challenge of risk reduction in existing buildings is critically important. Removal, replacement, and retrofit of existing unregulated and unsafe buildings requires an incremental approach that can reduce risk over a reasonable period of time at a feasible cost.

The proposed agenda charts seven closely related strategic sets of actions that aim to reinforce the regulatory capacity of countries at various stages of development.

### Seven points of intervention to establish and expand building regulatory capacity

1. Establish a sound legislative and administrative foundation at the national level.
2. Develop a building code suitable to local social and economic conditions that facilitates safe use of local building materials and practices.
3. Strengthen implementation of building code through plan review, site inspection, and permitting at the local level.
4. To support code compliance, provide advisory services in addition to inspection and enforcement.
5. Take advantage of opportunities for regulatory interventions.

6. Clearly identify hazard zones and restrict development according to exposure.
7. Advance supporting institutions.

The agenda does not offer a sequential path for extending regulatory capacity. Reforms described in the agenda can be carried out simultaneously and tailored to the specific level of development of the cities and countries where they will be initiated.

The agenda is not exhaustive. It does not seek to address all aspects of reform or all issues related to the larger context of policy and regulatory governance. These interventions focus on improvements that can be undertaken incrementally within the realm of building and land use regulation, with an understanding of opportunities and constraints of the specific development context.

1

Establish a sound legislative and administrative structure at the national level.

**1.1.** Establish a legislative foundation for a building and land use regulatory authority to protect public health and safety and reduce disaster and chronic risk.

**1.2.** Adopt a legal framework to support the effective enforcement of building code regulations at the local level.

**1.3.** Adopt other critical legislation that contributes to compliant construction.

#### 1. Establish a sound legislative and administrative structure at the national level.

**Recommendation 1.1** Establish a legislative foundation for a building and land use regulatory authority to protect public health and safety and reduce disaster and chronic risk.

Urban law provides the foundation for effective urban management and is essential for a successful policy implementation at the local level. National legislation provides the framework for participation in planning and regulatory processes at the local level. National policy can define the role of national and local government agencies to regulate land use and construction as well as to implement instruments for effective disaster and chronic risk reduction.

**Recommendation 1.2** Adopt a legal framework to support the effective enforcement of building code regulations at the local level.

The legislative foundation of a sound building regulatory system provides for the promulgation of a comprehensive uniform building code. Beyond the building code, other legislative action is critically important to establish the basis for local regulatory implementation.

Legislation must typically define liability rules for the construction process; professional qualification and licensing requirements for engineers, architects, and contractors; swift, efficient, and well-considered dispute resolution processes; and legal provisions for disciplinary and oversight

## BOX 3.1 – Historical evolution of building codes in Japan

Japan has an extensive history of devastating earthquake disasters. However, building codes have significantly contributed to making Japan one of the world's most earthquake-resilient countries.

### 1919

Following serious earthquake damage to modern structures during the 1800s, scientific and engineering analysis provided the basis for the Urban Building Law of 1919. This law was introduced to regulate building construction in six major cities in Japan.

### 1920

In 1920, following the enactment of the Urban Building Law, the Law Enforcement Order introduced two key innovations. The law established Japan's first building permit system, which was operated by the police under prefectural government. In addition, it included technical requirements for usage, height, and other safety specifications associated with zoning and building codes, as well as structural design requirements for timber, masonry, brick, reinforced concrete, and steel construction.

The 1920 regulations also included allowable stress design, quality of materials, and dead and live loads—but not seismic requirements.

### 1923 - 1924

The 1923 Kanto earthquake registered a magnitude of 7.9. It resulted in significant damage to modern buildings, as well as those using reinforced concrete. This experience and subsequent analysis led to an important revision of the Urban Building Law in 1924. These revisions included the introduction of seismic force considerations and subsequent advances in seismic design methods.

### 1949

Post-World War II reconstruction considerably expanded building regulation with the following legislation:

- Construction Trade Law (1949)
- Building Standard Law (1950)
- Architect Law (1950)

These new laws aimed to safeguard the life, health, and property of citizens by providing minimum standards concerning the site, structure, equipment, and use of buildings; to define the qualification of engineers who could design buildings and supervise construction work; to improve the quality of those engaged in construction trades; and to promote fair construction contracts.

Aside from the legal code documents, the contemporary building regulatory system of Japan referenced standards developed by qualified government and nongovernment organizations such as

- Ministry of Land, Infrastructure, Transport & Tourism (Ministry of Construction at that time)
- The Architectural Institute of Japan
- The Japan Concrete Institute guidelines, specifications, and manuals

### 1971

Further key legal developments were marked by a revision to the Building Standard Law in 1971, which introduced expanded seismic design codes.

### 1981

Building on the foundations of the National Comprehensive Technical Development and Research Project (1972-1977) led by the Ministry of Construction, Japan's building code was considerably updated. The revised code, the majority of which is still in use, set the requirement that buildings be able to endure collapse or any serious damage to the structure and its users at extremely large earthquake scales with a return period of 500 years. In addition to the original standard that required buildings to withstand a lateral force of 20 percent of their total weight without damaging structural members, this standard set mandatory requirements for the ductility of the structure to withstand a lateral force of 100 percent of its own weight.

### 1995

The Great Hanshin-Awaji earthquake in 1995 proved that an improved building code can make a significant difference in the rate of building collapses. 97 percent of collapsed buildings had been built under old building codes, while those that complied with updated codes represented only 3 percent of the total number of collapsed buildings. This triggered a nation-wide large scale reinforcement of existing buildings. However, it also revealed previously unrecognized weaknesses in construction, which resulted in further refinement of seismic codes and responses to new developments impacting building regulation and safety.

### 1998

The Building Standard Law of Japan was revised in 1998, partially with the goal of introducing performance-based design regulations. The law also opened the building inspection and certification process to private companies, thus supplementing local governments who were previously the only competent authorities for conducting this process.

### 2006

The process for validating structural calculation was considerably strengthened following cases of code violation in 2005.

### Dramatic Reduction of Damage due to Earthquake Ground Motion

Japan's dynamic incremental improvement of building code provisions serves as an outstanding example of the value of combining building research and regulation to meet the challenges of disaster risk reduction. Continuous improvement of building codes, including rapid incorporation of lessons learned from disaster experience and thorough implementation of regulatory provisions, has supported a dramatic improvement of seismic performance in new Japanese construction.

*Source:* Mr. Yukiyasu Kamemura, Ministry of Land, Infrastructure, Transport & Tourism (MLIT); Dr. Tatsuo Narafu, JICA; Keiko Sakoda Kaneda, World Bank; Shunsuke Otani, Chiba University.

mechanisms related to building professionals and the building and real estate industries.

As highlighted in the introduction of this report, building and land use regimes in developed countries have evolved incrementally over time and created increasingly resilient systems to sustain chronic and exceptional risks. Japan's experience offers a strong illustration of this principle (Box 3.1).

**Recommendation 1.3** Adopt other critical legislation that contributes to compliant construction.

A legislative foundation should build incrementally on other national legislation, which exists as part of a larger ecosystem of institutions that can strongly influence regulatory outcomes. Examples of critical legislation include legal provisions for the recognition of digital signatures that enable automated administrative procedures, accountability measures for public servants, insurance laws, legal mechanisms enabling housing finance for lower-income groups, and laws establishing the process for tenure security.

## 2

Develop a building code suitable to local social and economic conditions that facilitates safe use of local building materials and practices.

**2.1** Establish an open, participatory, consensus-based process for code development.

**2.2** Adopt a local building code referencing an established model code while incorporating necessary adaptations to local context.

**2.3** Develop a comprehensive building code that covers the full range of relevant construction types and practices.

**2.4** Establish building materials testing and certification laboratories that are accessible to major construction zones.

**2.5** Provide for wide dissemination of code documents and training for builders and owners based on code documentation.

**2.6** Create and maintain public awareness of basic safe construction principles for the community, building owners, and informal sector builders.

## 2. Develop a building code suitable to local social and economic conditions that facilitates safe use of local building materials and practices.

**Recommendation 2.1** Establish an open, participatory, consensus-based process for code development.

A building code must reflect the social, technological, and economic reality of the country. Code documents cannot be simply transported from a high- to low-income country. Compliance must be feasible to the greatest extent possible with locally available materials and skills. An inclusive and consensus-based process for developing a building code involves the participation of building

professionals, builders, building owners, and building occupants, as well as those with expertise on health, safety, and disaster risk.

Adequate building safety regulations are

- **Fit for purpose from a technical perspective.** Building code provisions should incorporate the best knowledge and scientific understanding of potential hazard loads and expected structural and functional performance.
- **Tailored to the needs and assimilation capability of the country,** with specific reference to its risk profile, the building culture, capacity of local builders, availability of materials, educational facilities, equipment, and income levels.

- **Endorsed and accepted by relevant stakeholders in the building process.** There must be broad consensus on the balance of risks and costs acceptable for building performance as provided for in the particulars of the code. Stakeholders must accept the specific implementation and enforcement mechanisms as legitimate and fair.

Meeting these requirements entails effective stakeholder consultation and participation. Several tools can be used to facilitate this involvement, as follows:

*Notice and comment (or “public review process”):*

The issue of interest to the regulator, the intent to regulate, or the draft regulation is published and open for written comments by all interested parties (individuals and organizations) for a given period.

*Surveys:* Conducted via Internet, phone, or some other means, surveys target different stakeholder groups and audiences. They can be used to assess a situation prior to developing a regulation, to gather views on an issue or on proposed regulations, and to obtain feedback on regulations already introduced.

*Focus group discussions:* These are held at various levels (national interest group representatives or grassroots, for example) and in various formats. They can be used to assess a situation, gather views, discuss the contents of a proposed regulation, and get feedback on existing regulations.

**Recommendation 2.2** Adopt a local building code referencing an established model code while incorporating necessary adaptations to local context.

It is possible to develop a local code based on an established model code as long as it is supported by a thorough analysis and adaptation process carried out locally. Jamaica adopted this approach by referencing the International Code Council (ICC) family of codes.

**Recommendation 2.3** Develop a comprehensive building code that covers the full range of relevant construction types and practices.

Building codes should provide for safer construction for the full range of prevalent construction types—that is, for technically engineered and sophisticated structures as well as traditional indigenous and non-engineered construction.

### BOX 3.2 – How Jamaica adapted and localized an international model building code

In 2003, the Jamaican Institute of Engineers initiated the development of the Jamaican National Building Code (JNBC). Early in this process, the working group favored the ICC’s model building code as the base code for Jamaica. Rather than transposing the ICC code into Jamaica, the approach consisted of drafting an application document to the ICC to present special values, parameters, and conditions for Jamaica.

This approach had tangible advantages for Jamaica. First, it spared the reform team the high transaction cost of developing an entirely new document from scratch. Secondly, it enabled Jamaica to tap into a building code system that was adequately resourced to keep the code current with the constant changes in building technology and weather patterns.

Furthermore, using the ICC model code satisfied three major directives from the government of Jamaica—namely, that the code should cover the widest possible range of building types, ensure as far as possible that no single disaster could destroy the entire building infrastructure of Jamaica, and assure that all buildings could be accessible by the disabled. An essential task of the working group assigned to the project was reviewing five ICC codes and writing the appropriate application documents that provided the local calibration and necessary adjustments to specific national construction techniques and risk environment.

*Source:* Based on DaCosta [no date].

### BOX 3.3 – Nepal Society for Earthquake Technology and the Nepal Building Code

The devastating impact of the April and May 2015 earthquakes in Nepal provided an early test of an innovative approach to building code implementation. The NSET has carried out a multifaceted program of earthquake risk reduction over the past 20 years, and its initiatives have included building code development, mason training, school retrofit, and regulatory capacity building.

Developed in 1994, the Nepal Building Code (NBC) addresses the full range of locally prevalent construction types, including non-engineered indigenous structures. Most buildings in Nepal are built by owner-builders or local tradesmen. Neither group is trained in seismic construction. In the absence of basic regulatory capacity, the Nepalese code development team chose to set realistic objectives for the design of technical standards and guidance materials. For simple, small-scale construction, the code proposed technical guidance as “rules of thumb,” assuming that simple but essential structural details could be checked by nonspecialist staff of municipal building departments.

The NBC recognized the full spectrum of current forms of construction through a four-tier building permitting system. On this basis, it developed a hierarchy of building controls consistent with the existing capacity on the ground in terms of both construction practice and regulatory application of compliance checks.

#### International state-of-the-art construction:

There are occasional examples of such construction, including high-rise hotels and office buildings, in the country. If consultants ensure that their designs meet recognized international standards, the designs are considered to be in conformance with NBC.

#### Professionally engineered structures:

These include all usual structures such as hospitals, commercial buildings, factories, warehouses, and multistory buildings. For such buildings, design requirements are provided in the NBC.

#### Small buildings designed to meet “rules of thumb”:

This category is defined as buildings constructed with modern materials, such as concrete and steel, but not exceeding simple criteria of height, configuration, and number of stories or floor area. Mandatory rules of thumb are provided. The requirements are typically confined to the maximum span, minimum reinforcing and member sizes, positioning of earthquake-resisting elements, and other such rules. The guidance materials are provided in a form that an experienced construction manager or mason can understand while presenting sufficient detail to pass the permit review of the building department.

#### Non-engineered construction employing traditional materials and skills:

These guidelines are based on the analysis of some 50 typical prevailing building types in Nepal constructed by employing vernacular materials and skills. Two sets of guidelines have been developed, one dealing with low-strength masonry and another dealing with earthen structures. The guidelines provide simple rules for improving seismic safety of these structures. Although these recommendations are described as guidelines, they are intended as mandatory for structures built in areas controlled by a building permit-issuing local authority.

Sources: Parajuli et al. 2000; UNCRD 2008.



Nepal is a low-income country facing a daunting disaster risk. The Himalayan mountain range is a zone of exceptional seismic activity. The collision of tectonic plates that gave rise to the highest mountains in the world also is capable of generating great earthquakes. Due to the severe climate and limited availability of building materials, local construction is particularly vulnerable to seismic forces. The Kathmandu Valley was struck by a major earthquake in 1934. Since that time, the area's population has grown to roughly 2.5 million people, who live in structures designed and built without the benefit of formal regulatory oversight. The 2015 earthquakes have more recently revealed the consequences of population increase and local construction practices. Organizations such as the Nepal Society for Earthquake Technology (NSET) have recognized the serious exposure and vulnerability of the Kathmandu Valley and have pursued a range of strategies to reduce earthquake risk for the people of the area since the early 1990s.

In many developing countries, earthen dwellings are a traditional housing solution, as appropriate soils are abundant and inexpensive. Unfortunately, because earthen houses are built informally, they tend to collapse in earthquakes, causing considerable economic losses and casualties. The

earthquakes that occurred in Huaraz, Peru (1970), and in Bam, Iran (2003), caused the tragic deaths of thousands of people who were crushed under their own earthen houses.

Peru addressed the vulnerability of adobe houses by including guidelines for their design and construction in its National Building Code. This approach illustrates how one country managed the tradeoff between the need to reduce disaster risks and the recognition that non-engineered construction was a social and economic necessity for millions.

**Recommendation 2.4** Establish building materials testing and certification laboratories that are accessible to major construction zones.

Uniform and certified performance criteria for building materials are essential for the design and construction of safe buildings. The design of structures assumes that materials will perform in a uniform and predictable way. Quality control for building materials requires standard test facilities and laboratories that can certify the characteristics of materials such as cement, aggregate, cement masonry units, and steel. A network of materials testing laboratories must be located near areas of significant construction activity.

### BOX 3.4 – The Peruvian Building Seismic Code for earthen buildings

The first Peruvian Adobe Seismic Code was approved in 1985 as an integral part of the National Building Code. This code has been used to develop general guidelines to generate seismic codes and as a crucial reference for the development of seismic codes in other vulnerable countries, such as India and Nepal. It was updated in 2000 to describe the scope, general requirements, and definitions of structural elements and components. It describes the seismic behavior of adobe buildings and provides specifications for the dimensioning of the structural systems and the design of adobe walls.

The earthquake-resistant code provisions for adobe are addressed to professionals involved in the design and construction of adobe buildings, not to certified professionals that typically operate in the formal building

sector. In most countries, only certified professionals are legally allowed to approve and sign off on design projects, and thus belong to the formal system. Most of the people that build and live in adobe houses do not know or use the code; therefore, most adobe codes for seismic areas do not effectively influence building practice.

After issuing the Peruvian Building Seismic Code for earthen buildings, Peru has found it is necessary to complement these codes with construction manuals, booklets, and guiding materials, as well as with educational campaigns carried out through local governments, NGOs, and the media.

*Source:* Blondet, Vargas, and Tarque 2005.

### BOX 3.5 – A promising example in a lower-middle-income country: How Guatemala developed a new accredited laboratory for building materials

In 2002, Guatemala established the Guatemalan Accreditation Body (OGA), a key component of the National Quality System within the Ministry of Economy. In 2014, OGA awarded laboratory accreditation to Centro Tecnológico del Cemento y Concreto (CETEC) for ISO/IEC 17025. This is the main ISO standard used by testing and calibration laboratories to demonstrate their technical competence. The main technical areas covered by CETEC include concrete, cement, soil mechanics, and chemical tests. The laboratory is equipped with testing equipment for cement, lime, concrete, aggregates, and soils. Its annual operating budget is approximately \$1.5 million.

With an internationally recognized accreditation body (OGA), Guatemala has actively started to accredit conformity assessment

bodies, including construction materials testing laboratories. This step represents a remarkable move toward improving public health and safety. It also demonstrates that the country understands the importance of construction materials quality in a disaster-prone country exposed to recurrent volcanic activity, hurricanes, and landslides. In 1976, for example, an earthquake caused 23,000 fatalities and resulted in economic damage equal to 18 percent of GDP.

*Source:* Sylvana Ricciarini, American Association for Laboratory Accreditation.

The accuracy and integrity of the materials testing certification process must be assured through a system of accreditation. Efforts should therefore be made to expand the capacity of national accreditation mechanisms and to support actual accreditation of local specialized laboratories with expertise in building materials testing.

**Recommendation 2.5** Provide for wide dissemination of code documents and training for builders and owners based on code documentation.

The local building department must be proactive in supporting the capacity of local designers and builders to comply with code provisions. Support for compliance is the necessary complement to inspection and enforcement in order to achieve building safety.

The government of Turkey and the World Bank initiated ISMEP in 2005 to address the vulnerability of public buildings in Istanbul and to reduce the devastation that could occur in the next major earthquake; the program incorporated a \$460

million loan from the World Bank. An important component of the program involved setting up training programs for structural engineers in earthquake engineering, particularly for the strengthening of existing structures. Though the project concluded impressively in 2014 with 3,630 newly trained building practitioners and engineers, there was little evidence that this training effort was a permanent program and part of a longer-term pre-disaster risk reduction strategy.

The World Bank, the Japan International Cooperation Agency (JICA), and USAID have supported training in improved construction techniques and code compliance for building trades, architects, engineers, and owner-builders in Turkey, Nepal, Pakistan, Madagascar, and Indonesia. These efforts were launched in the aftermath of disasters, but this type of training must be expanded and institutionalized for all new construction, particularly in areas of urban expansion.

**Recommendation 2.6** Create and maintain public awareness of basic safe construction principles for the community, building owners, and informal sector builders.

Post-disaster experience provides examples of successful and diverse educational and public awareness initiatives primarily designed to improve knowledge of community members, homeowners, construction workers, and foremen. These efforts are often driven and delivered by a wide range of stakeholders and specialized NGOs. Such initiatives should be expanded, coordinated, and institutionalized in pre-disaster scenarios. They should aim at demonstrating the benefits of safe building practices and creating the buy-in for a wider culture of code compliance.

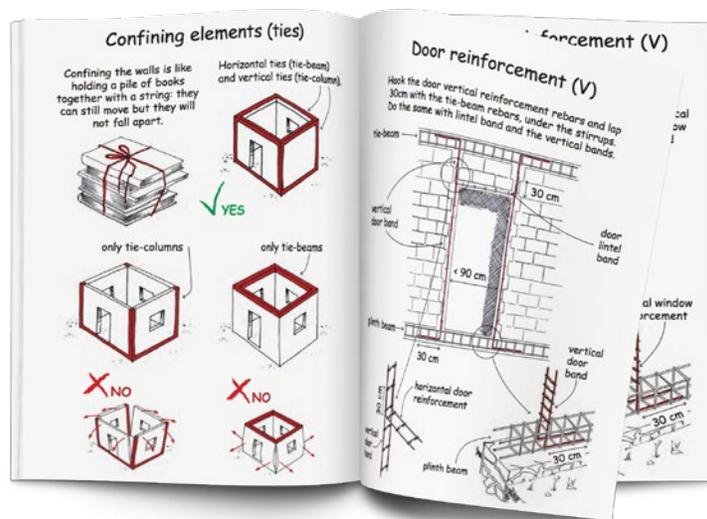
Existing tools can be rolled out and adapted to local circumstances. For example, the Earthquake Engineering Research Institute (EERI) and the Competence Center for Reconstruction (CCR), supported by the Swiss Agency for Development and Cooperation, updated a guidebook in 2015 to support technical training for earthquake-resistant construction of small buildings in confined masonry. This guidebook primarily targets masons and informal builders in developing countries. It is a leading reference in presenting the topic in simple and straightforward language and in explaining, in a step-by-step sequence, how to build a one- and two-story confined masonry building.<sup>91</sup>

Other efforts have focused on producers of critical building materials and creating awareness of the larger community of homeowners, NGOs, and government agencies. For example, Build Change has trained and certified concrete block producers in Haiti to increase the quality of their product. It has organized marketing and awareness events for each certified block maker, in which clients and neighboring homeowners can learn about the importance of using (usually more expensive)

quality blocks as well as about the costs and benefits of purchasing them.

A range of innovative communications solutions have also aimed to increase community-wide commitments to safer building practices. In August 2010, the Mennonite Central Committee (MCC) began training Haitian masons in earthquake-resistant building techniques. However, the NGO soon realized that the training of masons operating in the informal sector might not be enough to eliminate unsafe building practices. It decided to disseminate the tenets of safe construction to the public and to show homeowners, families, and friends that they too were responsible for ensuring that building standards were followed. It achieved this goal by hiring a comedy troupe and funding a lively and humorous video in the style of Haitian television, conveying clear instructions in earthquake-resistant building techniques as well as dos and don'ts for both workers and homeowners.<sup>92</sup>

**FIGURE 3.1** – Excerpt from EERI and CCR guidebook on confined masonry



3

Strengthen implementation of building code through plan review, site inspection, and permitting at the local level.

<p><b>3.1</b> Enhance compliance by applying principles of procedural justice and transparency.</p>	<p><b>3.2</b> Communicate changes associated with local building regulatory reforms.</p>	<p><b>3.3</b> Establish conflict resolution and appeal mechanisms.</p>	<p><b>3.4</b> Provide funding and support to building departments at the local level with technically qualified and adequately compensated building officials.</p>	<p><b>3.5</b> Simplify and reengineer building permitting and inspections procedures.</p>
<p><b>3.6</b> Apply ICT to support increased efficiency and transparency of building control procedures.</p>	<p><b>3.7</b> Apply risk management to construction permits and inspections.</p>	<p><b>3.8</b> Apply fee levels consistent with the cost of regulatory services.</p>	<p><b>3.9</b> Leverage resources from the private sector for more efficient and effective compliance checks mechanisms.</p>	<p><b>3.10</b> Create robust accountability mechanisms around public-private partnerships in building code compliance checks.</p>

### 3. Strengthen implementation of building code through plan review, site inspection, and permitting at the local level.

**Recommendation 3.1** Enhance compliance by applying principles of procedural justice and transparency.

A legitimate regulatory process is essential to achieving compliance. The regulatory process must be transparent and open to public scrutiny. The rationale for all requirements should be reasonable and presented publicly. The health and safety consequences of regulatory provisions should be presented to the public through community meetings along with information and communications campaigns.

*Doing Business 2015*<sup>93</sup> suggests that easier access to regulatory information, such as permitting fee schedules, is associated with greater regulatory efficiency, lower compliance costs, and better regulatory quality for businesses. This finding seems to confirm that more transparency and better-quality government tend to go hand-in-hand.<sup>94</sup>

Though transparency in regulatory design and implementation is key, it is consistently hard to measure. *Doing Business* provides some tangible measures of how large cities apply principles of transparency in construction permitting by comparing the level and quality of disclosure for specific regulatory requirements and administrative fees.

**Recommendation 3.2** Communicate changes associated with local building regulatory reforms.

Regulatory reform initiatives should place strategic communications at the heart of the process. Two-way communication with stakeholders will enhance inclusion and the legitimacy of the reform.

Regulatory practitioners often assume that once audiences understand the benefits of reforms, they will support them, but experience has shown that simply educating audiences and disseminating information is not enough to change behavior or to get reforms accepted. Because the reforms aim to transform processes, responsibilities, and behaviors within municipalities, changes will likely

### BOX 3.6 – Peru and Nicaragua: Simplification of building permitting procedures through communication [2006-2009]

Like many countries in Latin America, Peru and Nicaragua have been burdened with complicated and costly municipal regulations that impact operating licenses and construction permits. According to Doing Business 2005, in that year it took 189 days to obtain a construction permit in Nicaragua. Inefficient processes at the municipal level contributed to high transaction costs for those subjected to local regulations. Rates of building informality were hovering around 80 percent of building stocks, thus increasing the vulnerability of local population in the context of significant seismic risks in both countries.

The Municipal Simplification projects in Peru and Nicaragua, led by the International Finance Corporation (IFC), built strong support for reform by engaging stakeholders and creating a sense of ownership in municipalities. Each project employed an overarching strategic communications approach, anchored in a national plan that prioritized communications at each stage of the project life cycle. To ensure reform adoption and sustainability, the project teams localized the approach, carefully tailoring the communications strategies

and associated messages to local building authorities, building practitioners, and other partners. After Nicaragua had concluded its three municipal pilots in Granada, Masaya, and Leon, compliance costs of operating and construction permits were reduced by 30 percent on average; business formalization increased sevenfold.

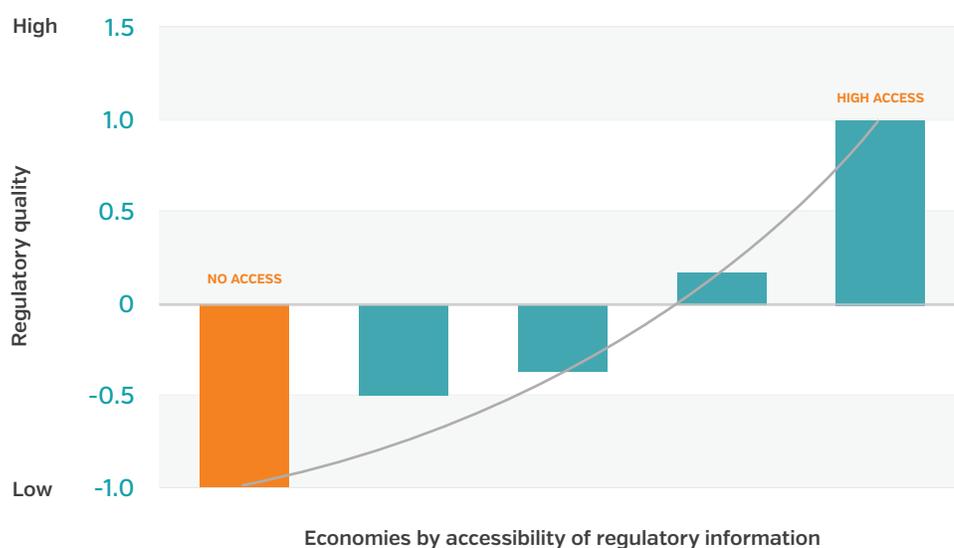
In both Peru and Nicaragua, an active strategic communication approach was crucial to putting administrative simplification on the political agenda and permanently tying the reforms to stakeholders' interests in the building sector.

Through a coordinated and documented communications strategy, the municipalities effectively harnessed public-private partnerships to build support and increase visibility in the press. They also used these partnerships to build a national umbrella campaign message, localize reform messages, deliver those messages to the right places, and develop local ownership of a national plan. These teams went beyond disseminating information, excelling at communicating strategically.

Source: IFC 2007.

### FIGURE 3.2 – Greater access to regulatory information is associated with greater trust in regulatory quality

Source: World Bank, *Worldwide Governance Indicators*; Doing Business database



Note: The 176 economies in the sample are divided into 5 groups based on the accessibility of information index, and averages are taken for the economies in each group on the Regulatory Quality Index ranking of the Worldwide Governance Indicators for 2009. The Regulatory Quality Index, ranging from -2.5 (weak) to 2.5 (strong), measures public perception of government's ability to formulate and implement sound policies. Relationships are significant at the 5 percent level after controlling for income per capita.

be resisted, particularly by those who have an interest in maintaining the status quo for rent-seeking purposes. Strategic communications can help to build the coalitions and means of pressure needed to effectively address forces that hold back necessary reforms.

**Recommendation 3.3** Establish conflict resolution and appeal mechanisms.

An effective mechanism for appeals and conflict resolution is essential for providing procedural fairness, transparency, and a level playing field. A quasi-judicial body involving both local government and private building professionals should be established to deal with disputes between building professionals and permitting authorities on matters related to the interpretation of the building code or sufficiency of compliance.

Where a regulatory authority registers or certifies building practitioners, an independent appeal body should be established to deal with appeals from practitioners concerning registration and certification. To be effective, the appeal system must ensure technical competence and procedural safeguards and must be managed transparently.

**Recommendation 3.4** Provide funding and support to building departments at the local level with technically qualified and adequately compensated building officials.

Local administrative and technical regulatory capacity requires technically qualified building officials. These officials carry out plan reviews and site inspections as required for all new construction, and they must be compensated at a level that both meets their qualifications and reduces vulnerability to corruption. They must also be provided with necessary support, including equipment and transportation.

Building officials must demonstrate technical competency in areas of review and inspection for which they have responsibility. These include structural, electrical, mechanical, and plumbing systems, as well as fire and natural hazards. Building officials should have professional qualification in engineering or architecture, or comparable building industry experience. Certification criteria have been established for each category of building department staff, for example by the ICC. With appropriate adaptation, these criteria can be applicable in low- and middle-income countries.

The staffing of building departments must be commensurate with the workload presented by construction activity in the authority having jurisdiction. The building department must be provided necessary equipment and logistical support to carry out the missions of plan review, site inspection, and enforcement.

### BOX 3.7 – How building regulatory decisions are appealed in Ontario, Canada

To ensure efficient and fair appeal decisions, professional regulators and industry professionals should participate in specialized conflict resolution bodies, and their views should carry the same weight as those of other members.

In Ontario, the Building Code Commission (BCC) is established by law. Although its members are appointed by the minister of housing,

all commission members have appropriate technical expertise and are appointed from both the regulatory and industry sectors. BCC decisions are binding but case-specific. Hearings never exceed eight weeks, which presents a decisive advantage of the BCC over the main court system. When this new appeal mechanism was introduced in the early 2000s, the backlog of long-term pending building permit requests was rapidly reduced by 25 percent.

Finally, building officials need to be adequately compensated, and the remuneration model for payment for the services needs to be carefully considered. This issue is relevant to all countries, irrespective of their income levels.

A prominent regulatory expert, Kim Lovegrove, suggests that building officials should not be remunerated on a competitive free market model. Given their unique statutory enforcement and consumer protection role, they should be paid based on a prescribed remuneration floor (the lowest acceptable level of pay), which should be set by the regulator and adequately indexed (for example, to the CPI if appropriate). This approach ensures that the building approval responsibilities are discharged in a manner that is commensurate with the real cost of performing the statutory function.<sup>95</sup>

**Recommendation 3.5** Simplify and reengineer building permitting and inspections procedures.

Simplification efforts should be carried out at the local municipal level and first target the core building permitting and inspections functions. They should be initiated in pilot municipalities chosen on the basis of local political commitment.

For deeper efficiency gains, the scope of simplification efforts should be expanded to include processes linked to noncore building code preapproval requirements from other authorities (such as land use planning, utilities, and environmental clearances). For example, in 2006, a three-year simplification reform of building permits and inspections was supported by the World Bank Group in Egypt. This reform targeted core municipal construction permitting processes and 18 related administrative approvals from other public agencies in the municipality of Alexandria. One focus was preapprovals from non-building-code entities, which consumed almost 40 percent of the time builders spent trying to obtain



construction permits. This effort was participative, and it fully engaged building code officials to ensure their buy-in to the greatest extent possible. Also impacted were other preapproval authorities involved in the building permitting process, such as the Industrial Development Authority, the Environmental Affairs Agency, and the Civil Aviation Authority. Other simplification reforms supported by the project included

- Turning ex ante preapproval requirements imposed on investors into a simple notification of the building project to the relevant public agency.
- Suggesting and creating risk thresholds to eliminate any preapproval requirements for small and low-rise buildings.
- Agreeing on maximum time limits for the issuance of approvals.<sup>96</sup>

Simplifying administrative procedures lowers transaction costs and increases legitimacy and regulatory compliance. Building regulatory reforms initiated in Ontario in 2001 relied on the two-pronged approach of improving skills and accountability of building practitioners and significantly streamlining procedures. In 2006, more than four years after the reforms were initiated, they had contributed to achieving better

### BOX 3.8 – A standardized simplification of building permitting procedures: A four-stage approach

To be effective, administrative simplification should proceed in four stages. The approach outlined below was used in Turkey after the 1999 earthquake; in Colombia, Ecuador, and Peru in the past 10 years; and more recently in Kenya and Rwanda (respectively in 2011 and 2012).

1. **Process mapping:** The outcome is a detailed description of all the steps and procedures, the average duration of each procedure, the related fees, the documentation required, and the specific legislation or regulation prescribing this step or procedure.
2. **Re-engineering of procedures:** Working groups analyze the procedures with the objective of removing those that are redundant or add no value to controls and risk management.
3. **Testing:** This stage formalizes new processes and trains building code officials and inspectors.
4. **Automating the new process:** This stage establishes online submission of building plans, work-flow management, online issuance of permits, archiving of documentation, and reporting.

A reengineering process can be supported by a predefined “target process” considered consistent with best practices and with the objective of minimizing transaction costs. For example, in Ontario, documentation in support of municipal reform efforts recommended a standardized seven-step process of inspections for certain types of buildings and occupancy.

standards of construction, a decline of 12 percent in residential fire loss, and a reduction of 15 percent in civilian injuries.<sup>97</sup>

#### **Recommendation 3.6** Apply ICT to support increased efficiency and transparency of building control procedures.

Electronic solutions or e-construction permit systems and applications today encompass a multitude of technologies. They range from simple databases and back-office work-flow applications using generic software tools to a few sophisticated, web-based systems that enable building professionals to conduct their entire management construction project cycle online.

Efforts to improve work-flow management and introduce online permitting systems must be expanded. These efforts should be undertaken only after simplifying reengineering and administrative processes. These reforms must be developed together with a commitment from planning and building authorities to adopt a change management strategy, which will ensure that staff have the capacity to effectively utilize new technology.

Relevant authorities should take into account the availability and reliability of the local ICT infrastructure when designing online permitting solutions. The legal and regulatory infrastructure should also be considered, as outdated building acts and the lack of a legal basis for online transactions and digital signatures can hamper efforts to automate permitting systems.

ICT reforms may be implemented incrementally using open-source technologies with no license cost. Authorities may choose to build internal capacity before exposing their staff to the increased demand of online services. Building agencies can choose to first develop their back-office functions before developing a full range of online services.

With support from the World Bank Group, Kenya and Rwanda began ICT reforms related to e-construction permitting in 2011. These reforms have demonstrated that low- and middle-income economies can introduce successful ICT platforms with a relatively wide range of solutions from the start.

The new automated system launched in September 2011 by the City Council of Nairobi (CCN) was developed in less than two years and included training of the CCN staff and building code officials. The training reduced time of approval by 80 percent and transaction costs for the private sector by 60 percent. The City Council surpassed its revenue targets after it registered a 300 percent increase in permit applications.<sup>98</sup>

**Recommendation 3.7** Apply risk management to construction permits and inspections.

Risk-based approaches in construction permitting and inspections bring opportunities to streamline procedures and focus scarce implementation resources on buildings that matter most from a public health and safety perspective.

Building applications should be categorized into different risk groups. This practice has allowed one-stop-shops to be established in larger municipalities, where requirements have been

significantly streamlined and third-party review is not required for lower-risk groups.

Between 2006 and 2014, 88 countries established fast-track building permitting procedures for very small commercial buildings.<sup>99</sup> A closer look at the particular circumstances around these measures suggests that the reforms have often been narrow in scope and not always driven by risk factors.

With the rapid expansion of cities in developing countries, these measures were more a concession to the overwhelming growth of small unregulated buildings than a deliberate step at introducing risk management.

Consistent with good practice, the United Kingdom has recently started to implement a risk-based approach to home building and home improvements. To use the resources of local building agencies more effectively, it ended the practice of carrying out systematic site inspections at three predetermined stages of construction. It replaced this rigid and costly system with a

### BOX 3.9 – The Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP)

Initiated in 2005 and supported by a World Bank Group loan of \$460 million, ISMEP aimed to enhance the institutional and technical capacity of Istanbul, Turkey, in addressing seismic risks.

Component C of the project had a budget of about \$5 million and focused on improving building code enforcement in two pilot districts of Istanbul. A thorough reengineering and automation of construction permits and inspections services was carried out from January 2007 to December 2012, involving the building authority of the Municipality of Bağcılar.

- The scope envisaged for the shift from paper to online processes was particularly ambitious, as it involved
- Updating and digitizing a comprehensive database with detailed spatial data at the individual building level.
- Synchronizing GIS and MIS data into a single database at the municipality level.

- Digitizing of archives involving more than 47,000 paper folders.
- Training on new processes of over 100 people internally, in the municipality.
- Developing an online system for land use approvals and construction permits.
- Creating a dedicated call center to handle client requests.

Supported by a preexisting law promulgated in 2004 and recognizing e-signature, Bağcılar became the first municipality in Turkey to develop online building permit services. As of October 2012, the project had reduced necessary documentation by 35 percent and had reduced time for issuing a building permit by 55 percent.

Source: Adapted from Reis 2015.

**BOX 3.10 –** Implementing online construction in Nairobi, Kenya

Tepid enforcement of building regulations in Kenya has often resulted in porous oversight on safety, higher costs for all involved, and human casualties in Kenya's construction sector. Over the past year alone, no less than three buildings have collapsed in Nairobi County despite the new e-Construction Permit Management System (e-CP) being in place. The collapsed buildings did not have the required construction permit approvals from the relevant county departments. The lack of adherence to proper procedures and building regulations increases the risk of collapsing.

The e-CP system was developed with the support of the World Bank Group's Investment Climate Program to help speed and simplify building permit approval processes, improve administrative efficiency for construction permits and promote best practices within the construction industry. The e-CP system allows inspection officers to track all developments and record progress of the construction remotely by inputting information through tablets. The new system generally makes it more efficient to monitor and enforce any constructions approved through the system.

The e-CP streamlines the submissions process and makes it more transparent, as applicants will be able to monitor the status of their application in real time through a web-and SMS-based tracking and notification system. Architects in Nairobi County acknowledge that ad hoc and informal charges previously imposed on them, such as unofficial fees to expedite approval processes, have been reduced

significantly. This system also has the potential to ring-fence building permit fees that are a critical revenue stream for the county.

Despite challenges in the prevalent ICT and legal infrastructure in Kenya, the web-based software application introduced by the City Council of Nairobi (CCN) enabled eight major functions that radically transformed the management of construction permitting and inspections in Nairobi after 2011. These key functions included

- Online registration of building professionals and property developers.
- Online submission of building plans.
- Workflow management, specifically concurrent review and evaluation.
- Online issuance of permit upon approval.
- Document management and archiving.
- Support for field inspections using mobile devices.
- Client interactions through SMS/email notifications and online tracking.
- Management reporting and oversight.

*Source:* IFC



risk-based approach to inspection. Local building authorities now typically develop a service plan detailing the stages of work that will be inspected. The plan considers the project's size, complexity, construction type, and ground conditions as well as the builder's experience, thereby providing a more targeted and calibrated regulatory response to the particular risk factors on the ground.<sup>100</sup>

**Recommendation 3.8** Apply fee levels consistent with the cost of regulatory services.

The aggregate cost of planning, building permits, and inspection fees should be set at a reasonable level that ensures the financial self-sustainability of building code municipal services. Not only should

these levels be based on the cost of recovery for services provided by the municipality, but they should also strive to be affordable within the local socioeconomic context. Specifically, they should not exceed 3 percent of the cost of construction and should seek to move closer to the current OECD average of 1.7 percent.<sup>101</sup>

To facilitate compliance, building regulatory fees and collection processes should be based on the cost of recovery for building control services.

**TABLE 3.1—** Good practice in setting and administering building fees

Practice	Background
Establish fees levels based on cost recovery for building control services	Fees should include the costs associated with the review of plans and any inspections along with overhead costs. This is the approach followed by New Zealand, where building consent agencies charge fees for issuing a building code compliance certificate when the building is completed.
Ensure that building control fees do not fulfill a tax purpose	Low municipal tax resources often create an incentive to turn building permit fees into proxies for tax revenues. If deficiencies in the property tax system require collecting funds at the time of construction, the tax portion of the building permit fee should be clearly delineated in the interest of transparency and accountability.
Charge small, fixed fees for small projects presenting no risk to public health and safety	For small buildings, setting a small, fixed fee is considered good practice. Minimum fees are necessary because the cost of providing services is not directly proportional to the area or cost of the building; a minimum charge is therefore needed to cover enforcement costs for small projects. Large projects with substantial permit fees will typically cross-subsidize smaller projects.
Publicize fee schedules	To support efforts on transparency and process efficiency, fee schedules for permits and inspections should be publicized and made available on the local authorities' website and other means of communications.

**Recommendation 3.9** Leverage resources from the private sector for more efficient and effective compliance check mechanisms.

Strengthening capacity for plan reviews and inspections should be pursued through collaboration with the private sector, following particular institutional and organizational arrangements consistent with local needs and opportunities. Major reforms in building code implementation initiated in the past 20 years have sought to take advantage of resources and expertise available in the private sector. These reforms were driven by the greater complexity of building technologies and increased pressure on scarce municipal human resources. Collaboration with the private sector has been a source of innovation in building code implementation procedures, with useful experience emerging in high-income countries, transitional economies, and middle-income countries.

In a growing number of countries, municipalities can use licensed or accredited private sector engineers to carry out third-party plan reviews or inspections to verify project compliance with building code requirements and approved building plans.

An encouraging outcome emerged from a reform initiated in Colombia. In the early 1990s, Bogota's Planning Office was seriously understaffed and unable to cope with the demand created by new construction. In 1995, the Planning Office began to use private professionals to carry out plan reviews and issue building permits. As a result, the average time needed to process construction permits plummeted, from a daunting three years in 1995 to just 33 days in 2012. The use of private engineering expertise could possibly be extended to building inspections, which are still the responsibility of local "prefects"—individuals who lack the technical and financial resources to conduct professional inspections yet operate within the constraints of a demanding seismic environment.

**Recommendation 3.10** Create robust accountability mechanisms around public-private partnerships in building code compliance checks.

When the conditions are appropriate, public authorities should ask for private sector assistance to ease the burden of administrative procedures. However, this approach should be strongly supported by robust safeguards to ensure that private sector building professionals are qualified, actually evaluated, and supervised by a centralized

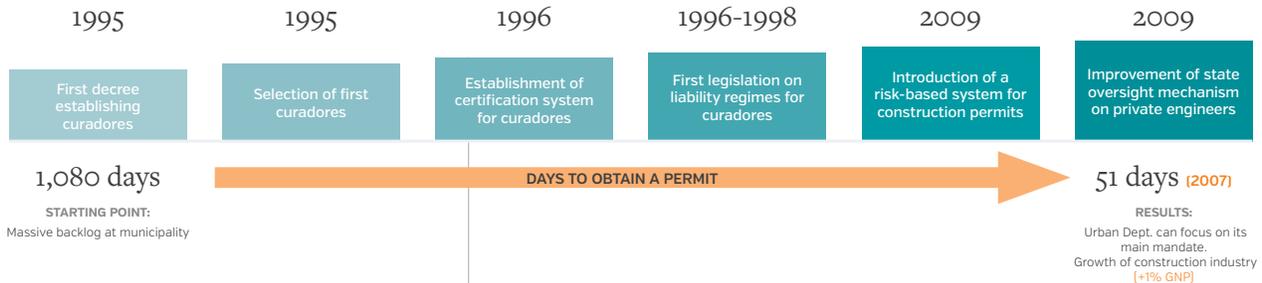
**BOX 3.11** – How FYR Macedonia ended a bureaucratic system of building code implementation by collaborating with the private sector

Drawing from the experience of European Union countries, and in an effort to improve building safety and compliance, FYR Macedonia radically amended its Construction Act in 2008. The change introduced mandatory licensing for engineers and contractors. It also allowed private independent engineers to review design and construction to establish compliance with approved plans and building code requirements. Municipal authorities were no longer involved in technical building reviews; instead, modern-day municipalities now ensure that the appropriate process is followed and that buildings are constructed in accordance with local planning

and zoning requirements, controlling building size, setback, height, and use.

A preliminary review of the reform conducted in 2012 concluded that the move toward independent private sector compliance checks was effective and efficient. FYR Macedonia jumped 86 ranks in the indicator for "dealing with construction permits" in *Doing Business 2012*. It avoided the pitfalls of an overly bureaucratic system, freed up resources in local planning departments, and created more reliable checks and balance in a country marked by frequent seismic activity.

**FIGURE 3.3 –** Colombia: Using private sectors to issue building permits and developing accountability in an incremental way



or specialized agency, and that risks of conflict of interests are monitored and minimized.

A comprehensive study conducted by the Delft University of Technology analyzed the results of involving private sector expertise in building regulatory enforcement in Australia, Canada, and New Zealand.<sup>102</sup> Tracing roughly 20 years of building code implementation in these three countries, the study concludes that regimes relying on independent, private, third-party enforcement develop greater inspectorial depth, which leads in turn to “better regulatory goal achievement.”

The same study also warns that introducing building controls systems based on private sector third-party mechanisms holds the potential of a loss in “equity and accountability. In 1994, the state of Victoria in Australia introduced a competitive system of building controls that allowed private building surveyors as well as municipal councils to issue building permits. Those in the construction industry reported anecdotal cases of private surveyors yielding to commercial pressure by endorsing substandard building practices. The state of Victoria responded by improving oversight mechanisms on building professionals and private surveyors.<sup>103</sup>

Reforms in FYR Macedonia and Colombia show that the introduction of efficient private

building controls should always be supported by strong safeguards, usually in the form of more stringent qualification requirements for building professionals, as well as robust disciplinary and oversight mechanisms. Both countries are now in the process of building these checks and balances to offer more mature and robust building code enforcement systems. In Colombia, the 1995 reform allowed private sector practitioners to issue permits<sup>104</sup> in order to address serious backlogs and inefficiencies in the building planning agencies. This reform was followed over the subsequent 15 years with the incremental development of qualification requirements for this new category of private professionals.

## 4

To support code compliance, provide advisory services in addition to inspection and enforcement.

**4.1** Enhance the supporting role of regulatory function rather than police enforcement.

**4.2** Use regulatory capacity to coordinate training for building trades, architects and engineers, and owner-builders on improved construction techniques and code compliance.

#### 4. To support code compliance, provide advisory services in addition to inspection and enforcement.

**Recommendation 4.1** Enhance the supporting role of regulatory function rather than police enforcement.

Building regulators should make use of existing human resources in building and planning agencies to reach out to stakeholders and provide technical advice and guidance for improved disaster resilience. This approach should aim to increase compliance with minimum standards of safety in certain communities and in relation to specific building practices and local hazards, thus helping to reduce risk. As illustrated in the Central Java case study (Box 3.12), this approach requires a strong effort in communications by promoting and facilitating an advisory role for building inspectors. It seeks to change behaviors by building trust and confidence, as opposed to rely only on punitive approaches and traditional police enforcement.

Following the 2006 earthquake in Central Java, JICA facilitated an innovative initiative that used the formal building administration capacity and building permitting process to improve the quality and seismic resilience of 330,000 reconstructed non-engineered houses. The initiative provided cash transfers to owners involved in post-disaster reconstruction—conditional on their house passing predefined inspections at three different stages of construction. Interestingly, before the earthquake, the prevalent form of housing in the area had been informal and had escaped any measure of

compliance with minimum safety standards. These advisory efforts targeting building trades and owner-builders with guidance on improved construction techniques and code compliance should be institutionalized and extended beyond reconstruction and applied for long-term risk reduction.

**Recommendation 4.2** Use regulatory capacity to coordinate training for building trades, architects and engineers, and owner-builders on improved construction techniques and code compliance.

As part of broader building code compliance strategies, building authorities should use their influence to partner with the private sector and ensure that all stakeholder groups involved in construction have ongoing access to training. Training artisans, masons, craftsmen, and construction workers in hazard-resistant methods is particularly important.

Support for large-scale training programs for construction stakeholders is often part of major donor-funded post-disaster reconstruction programs. All too often, such innovations in training tend to end when the reconstruction process is completed; the level of political attention on risk reduction then begins to drop over time. Building on the cutting-edge experience of reconstruction programs, public authorities should institutionalize effective trainings, beginning with training in non-engineered and traditional forms of construction that are most vulnerable to hazards.

## BOX 3.12 – Case study: Post-earthquake reconstruction in Central Java, Indonesia

### An opportunity for future disaster risk reduction

On May 27, 2006, an earthquake of magnitude 6.3 hit the south coast of Java. The earthquake caused more than 5,000 fatalities, primarily due to building collapse. It destroyed 154,000 houses and caused 260,000 others structural damage. As in other developing countries, houses in the villages of Central Java were typically constructed by nonprofessional owner-builders or village laborers. Damage to traditional wooden structures was limited. In contrast, unreinforced masonry and nonductile concrete-frame buildings, which utilized nontraditional materials and building practices, suffered severe damage.

Soon after the disaster, the local government defined key principles for housing reconstruction in the affected region. These principles included recommendations for structural safety in housing reconstruction and provided direct cash transfers to residents for reconstruction. The cash transfer was made in three tranches conditioned on passing inspection at the three stages of the construction process. Residents were allowed to rebuild themselves or to make use of contractors.

As part of the post-earthquake reconstruction program, JICA provided assistance through the local government building code administration system. One of JICA's major contributions, made in partnership with Gadjah Mada University, was to develop "Key Requirements," which consisted of a package of simple technical guidance applicable for small one-story houses. The objective of the Key Requirements was to provide specific, simplified technical guidance on critical structural elements that contribute to greater resilience in traditional non-engineered construction. Shortly after the Key Requirements were developed, compliance with them became a requirement for the government cash transfer program.

JICA supported the provincial government in extending training on the Key Requirements to the staff of building departments of 17 districts. The initiative used the existing formal building administration and permitting process to introduce marginal improvement to the quality and resilience of traditional non-engineered housing. This targeted and temporary effort was tied to the post-earthquake reconstruction program in Central Java. This intervention has contributed the basis for a potentially permanent increase in quality and safety management for housing in the region.

### Results and lessons learned

In the end, nearly 330,000 houses were reconstructed under the reconstruction fund and subsequently benefited from the improved quality control mechanisms for previously non-engineered houses.

Building on this success, the Ministry of Public Works at the national level encouraged local governments to adopt similar mechanisms to improve the resilience of non-engineered housing and extend the benefits of the reconstruction program more broadly. JICA was invited to extend this intervention to additional districts (Kabupaten) and cities (Kota) in West Sumatra, North Sulawesi, and North Sumatra Provinces over the following six years.

At the national level, JICA assisted the Ministry of Public Works in developing standard models of ordinance for provincial governments based on the Key Requirements. To broaden and sustain the benefit of this regulatory advance, JICA also implemented outreach training programs on building control for community and local government officials.

The program in Central Java demonstrates how an existing regulatory system can be utilized to improve traditional forms of non-engineered housing: by using the formal permitting process to introduce key engineering concepts like structural resistance, the program reduced risks in a traditionally vulnerable building type. This experience also shows that established building departments can improve the quality and resilience of non-engineered structures through education, guidance, and compliance support, rather than relying solely on coercive enforcement.

To reduce losses in future disasters, the most important challenge is to ensure that the process for technical support and inspection can be institutionalized and sustained over the longer term. This will take time and a continuous effort that should be part of a broader disaster risk strategy rather than confined to short-term disaster recovery programs. This process requires commitment in sustainable financial resources and human capacity improvement, and will involve various actors such as national and local governments, community-based organizations (CBOs), universities, and the private sector, including the building sector.

*Source:* Dr. Tatsuo Narafu, JICA; Keiko Sakoda Kaneda, World Bank.

## 5

Take advantage of opportunities for regulatory interventions.

**5.1** Prioritize by building function and exposure to hazards.

**5.2** Utilize public building programs as points of entry for the regulatory process.

**5.3** Exploit disaster experience to advance regulatory policy.

### 5. Take advantage of opportunities for regulatory interventions.

#### *Recommendation 5.1* Prioritize by building function and exposure to hazards.

Application of regulatory resources should seek to maximize risk reduction, based on the importance of a structure's function or occupancy as well as its hazard exposure. The priority of function is typically represented by an importance factor, which increases the requirement for structural resistance to reduce the probability of failure during a hazard event.

Elevated importance factors apply to buildings whose functions are critically important immediately following hazard impact, as well as to structures that house functions that pose

secondary hazards, such as explosion or toxic release (for example, industrial, chemical, or fuel storage). Structures critical to disaster response include medical facilities (hospitals and clinics), response capabilities (police and fire stations and emergency management facilities), and other public services buildings. Elevated importance factors also apply to buildings that house vulnerable or immobile populations (nursing homes, elderly housing, and prisons) and places of public assembly where exposed populations are concentrated. Schools have special importance because of the social priority placed on the safety of children.

The special importance of schools and hospitals has been recognized in targeted initiatives by many organizations. The state of California (from 1933),

### BOX 3.13 – The Pakistan Rural Housing Reconstruction Program, post-2005 earthquake

The 2005 earthquake in Pakistan killed over 75,000 people and left more than 2.8 million in need of shelter. The government of Pakistan, in collaboration with the World Bank and other international partners, responded by launching a reconstruction program at a cost of over \$1.5 billion.

The reconstruction and repair of 600,000 units in scattered communities required a vast workforce with appropriate skills and training. In response to this need, a "cascaded training" regime was implemented throughout the affected area to create a critical mass of artisans, masons, and craftsmen knowledgeable in seismic standards and methods of construction. The "cascade" was designed to provide training to master trainers at the district level, who would in turn train craftsmen and the affected population in the widely scattered communities.

Included in this training regime was the construction of model houses at field level to allow trainers to demonstrate seismic-resistant construction techniques to masons and craftsmen. After the trainings concluded, the houses were left in place for continual demonstration. The masons and craftsmen that underwent this training program were certified, so that homeowners knew they were qualified for the reconstruction and repair work.

Another major innovation was the use of a special corps of building inspectors. These inspectors not only carried out inspections but also provided on-the-spot assistance and training on seismic-resistant standards if, during an inspection visit, the construction was found to be noncompliant.

*Source:* Arshad and Athar 2013.



the Organization of American States, UNISDR, and GFDRR have all supported safe school construction and retrofit of existing school buildings. The Pan American Health Organization and UNISDR have addressed the disaster resilience of hospital buildings. These occupancy-targeted initiatives are important but should be developed as the starting point for broad, comprehensive regulatory initiatives to reduce disaster risk for the entire building stock.

In prioritizing buildings, authorities should also draw on hazard zone maps to differentiate building requirements in proportion to expected hazard loads.

Functional importance and hazard exposure should not only be incorporated in the design requirements of the code, they should also be reflected in the diligence of review and inspection practiced by the regulatory authority.

**Recommendation 5.2** Utilize public building programs as points of entry for the regulatory process.

For any new building regulatory program, authorities need to identify feasible points of entry or starting points for regulatory intervention. For example, where the public gives building occupancy high priority, it becomes more feasible to initiate the regulatory function. The organizational management and funding of construction is also a factor in the feasibility of developing regulatory processes. Design and construction of public school buildings is typically managed by organizations with technical capacity and budgetary control over projects. These rudimentary capabilities provide the opportunity to demonstrate safe construction materials and techniques. The tangible example of school construction can be used to instruct students, faculty, and the community on the methods and benefits of safer construction.

Similarly, in the case of health facilities, a construction management capacity and budgetary control for construction quality can provide the starting point for a demonstration of the building regulatory framework. Once the regulatory process is introduced through these formal sector building types, the concepts of safe construction standards, compliance assistance, and inspection should be expanded to serve other elements of the built environment.

In the case of California, seismic building regulation was initiated to protect schools and schoolchildren following a damaging earthquake in Long Beach in 1933. From that starting point, the state has developed one of the most comprehensive and effective building regulatory systems in the world.<sup>105</sup>

**Recommendation 5.3** Exploit disaster experience to advance regulatory policy.

Timing is a major consideration in identifying a feasible point of entry for a building regulatory process. Though life-saving and relief activities must be the focus in the immediate aftermath of a disaster, the post-disaster period offers a valuable opportunity for introducing or reforming a building regulatory process. Disaster damage and loss are eloquent arguments for improving construction quality. The task of reconstruction offers an excellent opportunity both for implementing improved building standards and for institutionalizing building regulatory systems to guide long-term resilient development in the future.

6

Clearly identify hazard zones and restrict development according to exposure.

<p><b>6.1</b> Execute hazard mapping for potential urban extension areas in advance of unregulated development to direct new settlement to safer sites.</p>	<p><b>6.2</b> Reference hazard zones in building codes with emphasis on added structural requirements.</p>	<p><b>6.3</b> Execute hazard mapping for existing settlement areas to establish priorities for retrofit and relocation.</p>	<p><b>6.4</b> Provide infrastructure in safer areas to direct urban expansion and land use.</p>	<p><b>6.5</b> Make public comprehensive information on hazard exposure and the rationale for land use management.</p>	<p><b>6.6</b> Institute alternative uses to occupy hazard zones.</p>
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**6. Clearly identify hazard zones and restrict development according to exposure.**

**Recommendation 6.1** Execute hazard mapping for potential urban extension areas in advance of unregulated development to direct new settlement to safer sites.

Avoiding hazardous sites is a most efficient means of disaster risk reduction. Safe location of new developments reduces exposure to hazard impact and reduces the requirement and cost of structural

strengthening for resilience. Where possible, urban expansion should be directed to safer locations based on hazard mapping before uncontrolled informal settlement occurs. Alternative land uses should be encouraged for exposed areas such as floodplains, coastal hazard zones, and areas of elevated seismic or landslide risk. Hazard mapping should form an integral part of urban master planning, and its rationale should be widely shared with the public.

To realize the ultimate benefit of excellent hazard mapping initiatives, such as CAPRA (Box 3.14), there must be effective mechanisms to ensure that hazard information is applied to safe siting and to improved construction for urban development.

**Recommendation 6.2** Reference hazard zones in building codes with emphasis on added structural requirements.

Land use management is a fundamental tool for reducing disaster risk. Historical data and probabilistic modeling techniques make possible the development of hazard mapping, which distinguishes geographic zones in terms of

expected hazard event frequency and intensity. Such maps can be developed for flood, earthquake, landslide, snow load, wind, and coastal hazards. This differentiation of hazard zones is essential for efficient balancing of design requirements for anticipated loads.

To avoid the economic consequences of overdesign and the safety consequences of underdesign, hazard maps must be directly referenced in the building code. Compliance with hazard zone-related requirements must be assured through plan review and site inspection if the benefit of risk reduction is to be achieved.

### BOX 3.14 – Improving safe construction in Peru through informed building code regulations and seismic hazard knowledge

A CAPRA technical assistance project to update and improve the existing seismic hazard information in Peru, a country with a history of seismic activity, was carried out from late 2010 until March 2012. This helped to support the Peruvian national and local governments in getting better access to seismic hazard information as an input for any disaster risk reduction measures and activities (related, for example, to loss of life, infrastructure, buildings, and basic services). Seismic hazard information can be represented as maps and provide a visual and spatial understanding of seismic hazard. Maps and other seismic hazard information enable the scientific community, government authorities, and the general public to be better informed and plan for potential future events.

In addition, this information provides the necessary inputs to enable authorities to improve building standards by incorporating seismic design concepts in the construction of schools, hospitals, office buildings, and large public works.

The Peru probabilistic seismic hazard assessment exercise was the product of a technical assistance project using the CAPRA probabilistic risk assessment software platform. The project was sponsored and technically supported by the World Bank, funded by the Spanish Fund for Latin America and the Caribbean, and implemented by the Geophysical Institute of Peru. CAPRA is a free and open-source platform for probabilistic risk analysis to better inform decision making in disaster risk management.

The project's main objectives were to

- Prepare national level seismic information and maps for regulatory purposes, and
- Contribute to reducing risk resulting from inadequate design or construction. The results were incorporated into the update of the seismic design standard led by a governmental special committee.

The seismic hazard information produced under the CAPRA project is now used as an input in the seismic risk assessment developed to inform retrofitting and replacement choices for the school infrastructure in Lima.

The ability to access hazard and risk information will allow institutions responsible for building design standards to improve these standards and will contribute to a more effective building code regime. Technical and scientific institutions will need to regularly update this information through continuous research and additional data. However, the benefit of hazard maps and the critical information that they provide will only be realized if building codes are adequately enforced in Peru.

*Source:* Geophysical Institute of Peru; World Bank CAPRA Technical Assistance Project 2012

### BOX 3.15 – How the U.S. Geological Survey (USGS) makes information on hazard available to the public

One mission of the U.S. Geological Survey (USGS) is to develop and apply hazard science to help protect the safety and security of the U.S. The costs and consequences of natural hazards can be quite significant, and each year more people and infrastructure are at risk. USGS scientific research can help to explain and reduce natural hazard risks by effectively communicating reliable information about hazard characteristics, such as frequency, magnitude, extent, onset, consequences, and, where possible, the time of future events.

To accomplish its broad hazard mission, the USGS maintains an expert workforce of scientists and technicians in hydrology, biology, and geography, as well as earth, social, and behavioral sciences and other fields. It engages cooperatively with numerous agencies, research institutions, and organizations in the public and private sectors across the U.S. and around the world.

Science provides the information that decision makers need to determine whether risk management activities are worthwhile. Moreover, as the agency with the perspective of geologic time, the USGS is uniquely positioned to broaden society's perspective with information about events outside current memory - and in this way prepare society for similar events. The USGS has critical statutory and nonstatutory roles regarding floods, earthquakes, tsunamis, landslides, coastal erosion, volcanic eruptions, wildfires, and magnetic storms.

USGS produces and disseminates maps and other public information on the above-listed natural hazards to guide public and private decision making regarding disaster risk and risk reduction measures. These resources are made available to the public in a range of formats including digital.

Source: U.S. Geological Survey.

#### **Recommendation 6.3** Execute hazard mapping for existing settlement areas to establish priorities for retrofit and relocation.

Hazard mapping for areas of existing settlements is critically important for identifying and prioritizing highly exposed and vulnerable areas. Defined hazard zones in existing settlements provide the basis for allocating resources for eventual relocation, retrofit, or increased vigilance for response and relief planning.

Even in rapidly expanding urban areas, the greatest concentration of risk is likely to reside in previously unregulated existing areas. While this residual risk must be addressed, at present it is most important and most cost-effective to stop the expansion of risk in areas of new development. The financial and social costs of demolition and resettlement, or even structural retrofit, are far greater than the marginal added costs of safe siting and construction of new development. At the same time, the coincidence of extreme exposure, extreme structural vulnerability,

and critical community functions in existing settlements must be identified and dealt with on a priority basis.

#### **Recommendation 6.4** Provide infrastructure in safer areas to direct urban expansion and land use.

When infrastructure services—such as water, sanitation, electric power, and communications—are provided to existing slums or informal settlements, the cost has been two to three times as much as similar service provided at the outset of development.<sup>106</sup>

Preference for development in safer areas can effectively be led by rational and efficient installation of infrastructure service systems. This requires collective community organization and specific technical ability involving formal sector competencies. The informal construction sector has demonstrated impressive productivity in building houses on individual plots. This type of construction can often be more efficiently

carried out by less formal, owner-driven processes. Flexible and adaptive regulatory service delivery can provide the benefit of appropriate technical support and inspection to assure health, safety, and disaster resilience.

**Recommendation 6.5** Make public comprehensive information on hazard exposure and the rationale for land use management.

Public understanding of hazard exposure is fundamental to informed choice. Information on historical hazard impacts and scientific projection of future hazard impacts must be shared in a form that supports informed public and individual decision making. Although natural disaster risk may not be a dominant short-term concern of new arrivals to urban areas, they should be provided

with hazard information to factor into longer-term planning for security and advancement.

**Recommendation 6.6** Institute alternative uses to occupy hazard zones.

Urban land is at a premium in all parts of the world. The advantages of proximity to services and employment create a powerful force for development of convenient but unsafe sites. In order to preclude informal land invasions or market pressures for development, alternative uses for hazardous areas should be defined and implemented. Hazardous sites may be developed for low-occupancy activities such as urban agriculture or park and recreation areas. Such uses of hazardous areas serve to inhibit development and minimize new exposure to disaster risk.

**BOX 3.16 –** Limitation of development in hazard zones: Allowable land use in floodplains in Minnesota, United States

In the state of Minnesota, land use and building regulation measures have been applied to reduce flood losses in the United States. As a result, for some parts of the floodplain or in some communities, options for permissible land use are very limited. In other parts of the floodplain, most uses are allowed, but structures must be elevated or flood-proofed to maintain public safety and minimize risk of property damage during a flood. Communities will be regulated according to zones, which include low-density residential, high-density residential, commercial, industrial, and open space. A community can specify the allowable uses in each zone.

**Allowable floodway uses**

- Open space uses and limited grading and earth moving may be permitted if they do not create an obstruction or cause any increase in the flood levels. Uses such as gardens, farming, parks, trails, or golf courses may be allowed depending on zoning district.
- New structures, additions to existing structures, and substantial improvements to existing structures are prohibited.
- Construction should be outside the floodplain, with the lowest floor (including basement) above the regulatory flood protection elevation (RFPE). The RFPE is the 100-year flood (1 percent annual probability flood) elevation. The lowest floor must be elevated so that its walking surface is at the RFPE or higher.

**The key building standards that meet state and federal law**

- No placement of fill is permitted in the floodway.
- Top (that is, walking surface) of the lowest floor (including basement or crawl space) is at or above the RFPE.
- Fill outside the floodway is at 100-year flood elevation plus floodway stage increase, or higher, extending at least 15 feet horizontally from all sides of the structure.
- An “as built” survey is submitted to the zoning authority to verify that the development was built at the permitted elevation.
- All local ordinance requirements, including setback requirements (that is, from lot lines and for shore land management or wild and scenic rivers ordinances), are met. Many communities also require that the access (driveway and access roads) elevation is no lower than 2 feet below the RFPE.

Source: Minnesota Department of Natural Resources, Ecological & Water Resources.

## 7

## Advance supporting institutions.

<p><b>7.1</b> Improve regimes of tenure security to create greater incentive for compliance.</p>	<p><b>7.2</b> Increase the accountability of building professionals by increasing liability regimes backed by insurance mechanisms.</p>	<p><b>7.3</b> Improve the capability and accountability of regulatory agencies through quality control measures.</p>	<p><b>7.4</b> Leverage housing finance mechanisms to spur investment into safer housing.</p>	<p><b>7.5</b> Mobilize market demand for safer buildings.</p>
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### 7. Advance supporting institutions.

An effective agenda to improve regulatory implementation in low- and middle-income countries should not focus only on core land use and building code system elements. There are contributing institutions and regulatory instruments, all part of a larger regulatory ecosystem, that play an equally important role in achieving compliant and safe construction. While the list of such institutions and instruments is potentially long, the impact of proactive reforms in the following areas is particularly worth noting: security of tenure, liability mechanisms for building professionals, accountability instruments for planning and building departments, and housing finance mechanisms (with a focus on those targeting lower-income groups). The selection and prioritization of reforms across the larger field of regulatory institutions should be based on a careful evaluation of local circumstances and development priorities.

**Recommendation 7.1** Improve regimes of tenure security to create greater incentive for compliance.

The stronger land security is, the easier it is for households to invest in land, safer building materials, and more resilient forms of construction. This is particularly relevant to low-income groups. Any effort to improve building code compliance therefore depends on a larger commitment to land policy and land management reforms. Research

consistently shows that possession of greater tenure security results in greater investments in the structure, as well as improved social outcomes.<sup>107</sup>

No single prescriptive path leads to secured land tenure and property rights, but a wide range of policy and regulatory instruments can help address certain challenges and be adapted to meet local conditions. UN-Habitat regularly advocates the use of various alternative tenure options that can be adapted to circumstances in any area. It also promotes a cost-effective incremental approach to strengthening tenure rights, so that authorities can build capacity for more comprehensive and locally sensitive long-term options (Box 3.17).

Furthermore, Peru's experience from 1996 to 2004 demonstrates that land titling programs can be very expensive without necessarily achieving their objectives.<sup>108</sup> Many low-income households prefer the social cohesion that customary tenure arrangements can provide, or the mobility offered by renting, as long as they enjoy adequate security and land protection.<sup>109</sup>

**Recommendation 7.2** Increase the accountability of building professionals by increasing liability regimes backed by insurance mechanisms.

There is an opportunity to leverage insurance mechanisms into a strong driver of regulatory compliance. This opportunity is more relevant to middle- and upper-middle-income countries, where

### BOX 3.17 – UN-Habitat’s proposed incremental approach to improving tenure security

1. Provide basic short-term security for all households living in slums and unauthorized settlements and with informal or customary rights in urban, peri-urban, and rural areas. This can be best achieved through land proclamations, or through a simple statement by the relevant minister, for a specific period (typically three to nine months).
2. During this period, survey all extra-legal settlements in urban and peri-urban areas and identify any that need to be relocated. Offer residents priority for relocation to sites with close access to livelihood opportunities together with long-term tenure options.
3. Designate all other extra-legal settlements as entitled to medium-term forms of tenure with enhanced rights though not necessarily full titles. A simple option is to allocate community-based leases for a designated period, with options for extension.
4. Where effective local land management arrangements are in place, communities can be offered long-term tenure, for instance through Community Land Trusts, community-based titles, or cooperatives.
5. Households seeking individual titles obtain the agreement of the community, agree on property boundaries with their neighbors, and are responsible for financing and completing the necessary legal and administrative procedures, including the appointment and payment of surveyors and lawyers and property legislation.

Source: Kagawa 2002.

the insurance industry can exercise a growing influence and increase its market penetration over time. In France, for example, private liability insurance and insurance carried by building professionals and private inspectors are by far the main drivers promoting compliance with building standards.<sup>110</sup>

Assuming that market conditions are appropriate, meaning that there is a sufficiently established insurance industry, government authorities should consider mandating building professionals to carry a reasonable level of liability insurance. This would cover most claims likely to be encountered by designers, contractors, or public or private inspection agencies.

For policy makers, a particular challenge associated with the introduction of liability insurance is to avoid creating yet another barrier to entry for smaller and new entrants into the building design or construction businesses. At the same time, it is important to avoid instances of unfair competition, where responsible firms that obtain insurance are competing against firms that are unable or unwilling to obtain insurance (and that can therefore provide services at a lower cost).

In high-income settings such as Canada, building professional associations often require, through public legislation, that their members carry insurance. Where conditions allow it, other countries require a broad range of building professionals to carry liability insurance. Victoria, Australia, requires designers, draftspersons, and contractors to carry liability insurance, and it enforces this requirement through a builder registration system.

#### **Recommendation 7.3** Improve the capability and accountability of regulatory agencies through quality control measures.

The initiative to establish and maintain the accountability of local building regulatory agencies should be based on formal systems of quality management and accreditation. National authorities should take the lead in mandating local building authorities to become accredited.

Well-established systems of accreditation for building regulatory agencies are in place in high-income countries (for example, the International Accreditation Service [IAS] of the ICC in the U.S.). Despite concerns expressed in this report about transposing practices from high-income

to low-income countries, agency accreditation and staff certification offer operational models and functioning principles relevant to municipal building control activities in developing countries, with appropriate adaptation.

The IAS provides independent third-party recognition that a municipal building department is competent to carry out specific code enforcement activities. The IAS is a nonprofit, public-benefit corporation that has been providing accreditation services since 1975. It is a subsidiary of the ICC, a professional membership association that develops the construction codes and standards used by most municipalities within the United States. Its accreditation criteria reflect a strong commitment to maintaining transparency and procedural justice, an appropriate quality of service delivery, and a capacity to respond to natural hazards impacting construction (see Box 3.18).

While the IAS model of accreditation is primarily voluntary and provided by a private nonprofit public-benefit corporation, government authorities may also consider the innovative model of New

Zealand, which introduced state accreditation of municipal building consent authorities as part of its Building Act of 2004. The accreditation and registration scheme in New Zealand was established to promote consistent, standardized, and good-quality practices in building control and to ensure better technical capabilities and resourcing, including adequate processes to respond to disaster risks.

In July 2013, in an act that illustrates both the creation of accountability and the consequences attached to lower standards of institutional delivery, International Accreditation New Zealand (IANZ) withdrew its accreditation of the Building Consent Authority (BCA) of Christchurch. The grounds were deteriorating quality and speed of the building's consent processes as well as insufficient transparency. The BCA eventually regained its status at the end of 2014 after implementing a broad action plan that, among other things, streamlined administrative procedures, reduced compliance costs, promoted more efficient services to customers, and refocused decision making on risk-based principles.<sup>111</sup>

### BOX 3.18 – Three major themes in the IAS accreditation process

In strong alignment with recommendations made in this chapter, the IAS accreditation criteria for building departments typically determine whether the local authority is committed, among other things to

**Transparency and procedural justice:** The accreditation requires that the building department provides documented evidence of steps taken to avoid potential conflict of interests [3.2.6]; that complaints and appeal mechanisms are in place for administrative decisions taken by the department [2.5]; and that there is evidence of community outreach activities and disclosure of important documentation to the public [3.2.21].

**Quality of service delivery:** A system must be in place to regularly measure progress in meeting service goals such as turnaround time [2.28]. Quality assurance programs must be in place and include a range of self-imposed standards, such as audits and management

controls [2.25], and there should be a tracking system for continuing education requirements [3.3.8].

**A sufficient focus on disaster risks:** The agency should provide evidence that staff have met training requirements for performing post-disaster assessments and making substantial damage determinations in flood hazard areas. Two other DRR-related requirements include (a) the development and disclosure of adequate information on wind zones, flood hazard areas, seismic areas, or other geologic risk zones [3.1.2], and (b) demonstration by building departments their preparation is coordinated with other departments when they identify damaged buildings and conduct safety inspections after a hazard event [3.2.3].

*Source:* IAS, “Accreditation Criteria for Building Departments and Building Code Enforcement Agencies, AC251.”

**Recommendation 7.4** Leverage housing finance mechanisms to spur investment into safer housing.

Wider access to housing is typically correlated with increased economic growth and urban development. However, in most emerging economies, access to housing finance remains predominantly limited to middle- and upper-income households with stable and verifiable income. Only in a few countries, such as Mexico or Malaysia, have mortgage lenders reached down to finance moderate- or median-income households.

In countries with underdeveloped housing finance systems, buildings are constructed incrementally and informally with low-quality building materials and thus do not comply with planning and building code regulations.<sup>112</sup> Under such circumstances, safe code-compliant construction is difficult to attain.

Enumerating the requirements of a sustainable housing finance system exceeds the scope of this report. However, as part of targeted efforts to reduce disaster and chronic risks, public authorities should address housing finance needs of low-income and underserved households. As highlighted earlier, low-income groups are consistently more exposed to chronic and natural hazard-related risks.

Authorities should try in particular to support sustainable housing microfinance (HMF) in low- and middle-income countries. HMF portfolios remain small in proportion to GDP or bank assets, but have managed to reach a relatively large scale in places like Peru. Here, more than 1.2 million households have benefited from HMF within the framework of title formalization programs in the past few years. Peru shows that, under the right conditions, HMF can effectively address the needs of poor households and become a lucrative line of business for banks. In addition, because these households have also achieved security in their

titles, they now have a stronger incentive to invest in home improvements.

The combination of housing finance (to reduce the structural risks of incremental construction) and the monitoring of construction quality (to ensure code compliance) serves to protect both the health and safety of buildings occupants and the collateral of the mortgage lender.

Housing finance can be offered on the condition that the structure to be financed conforms to code and zoning requirements. In the case of financial assistance for reconstruction following the 2005 earthquake in Pakistan, financing was provided in increments conditioned on passing inspection at each of the stages of the construction process. The first tranche of funding was provided on approval of the site, the second on the completion and approval of the foundation, the third on the completion of the walls, and the final payment after approval of the completed structure. This proved a very effective means to ensure code compliance. This strict control was justified to protect the collateral, not to mention the well-being of the building occupant in specific conditions of the subsidized reconstruction program.

Where mortgage financing is offered in a nondisaster situation, a similar requirement for code compliance can be exercised with the cooperation of the local regulatory authority. Such control clearly benefits both the owner/occupant and the lender in terms of protecting the value of the loan. In sophisticated construction markets, lenders can require the participation of insurers to guarantee the value of the loan. In this case, the feasibility of underwriting is facilitated by the competence of the local regulatory authority in assuring both code compliance and reasonably predictable building performance under prescribed loads.

Neither lenders nor insurers have the capacity to manage plan review or site inspection independently. The presence of a competent regulatory authority and an adequate building code makes this type of leverage for public safety possible.

**Recommendation 7.5 Mobilize market demand for safer buildings.**

In a range of developed countries, building codes are recognized as a minimum acceptable standard of construction. Despite the fact that this minimum standard can provide the basis for calculating insurance premiums, it does not necessarily correspond to owner demand or expectations for resilient building performance. Voluntary standards that exceed code requirements have been developed for several aspects of building performance, including energy efficiency and disaster resilience.

In response to market demand, the private sector and NGOs have developed independent programs of performance certification to certify design and construction that meet performance standards beyond those provided for by codes. The success of independent building certification programs such as LEED and Fortified Homes (Institute for Business and Home Safety) and Resilience Star (U.S. Department of Homeland Security) show the value of building safety in the real estate market. Buildings certified as above-code enjoy higher valuation in the market and demonstrate market incentives for greater investment in building safety and resilience. When the consumer recognizes the value of resilient construction and is willing to pay a premium for such quality, the market becomes an effective driver of safe construction.

Voluntary choice of higher levels of building performance can be incentivized by both private and public means. Insurance companies can reduce premiums when risk reduction measures are

incorporated in building design and construction. This reduction can, in turn, increase access to mortgage financing. Public incentives for measures going beyond code requirements can include flexibility in zoning or parking requirements.

The majority of voluntary compliance instruments have emerged in developed countries in the field of “building sustainability” focused on energy and resource use efficiency. However, sustainability also refers to disaster resilience. Leading international green building standards such as LEED, BREEAM, and Green Star are now starting to incorporate elements and credits relating to climate resilience.

Additionally, there are resilience designation programs for homes such as “Resilience Star” and the Institute for Business and Home Safety “Fortified Home” program in the U.S. Both initiatives are based on the market value of certified added safety. The market approach leads to safer building products through profit-oriented response to informed consumer demand.

A recent initiative led by UNISDR, in collaboration with the Pacific Asia Travel Association and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), is now working with a wide range of public and private stakeholders in the tourism sector. The Hotel Resilient Initiative aims to develop standards and tools for hotels and resorts that can be used to demonstrate commitment to disaster resilience and customer safety. This initiative recognizes safety as a market value.

As noted earlier in this chapter, there is a good argument to introduce noncoercive instruments into compliance strategies. About 15-20 years’ experience in green building rating systems shows that voluntary mechanisms can be creatively combined with regulatory instruments to support more in-depth market transformations. For example, in Turkey, BEP-TR mandates a minimum

“C” energy efficiency label for any new buildings. Although attaining “C” is mandatory, the “A” and “B” ratings are voluntary and are respectively 40 and 20 percent more efficient than the “C” level. Compliance with “A” and “B” levels is encouraged through an incentive program allowing a local bank to provide lower interest rates on mortgages and construction loans.<sup>113</sup>

As dedicated building resilience standards and certification systems make their way into developing countries, there is an opportunity for local governments to promote these instruments as supporting mechanisms for risk reduction. Local governments can facilitate this process by providing incentives, especially nonfinancial

incentives. For example, municipalities in India are now supporting voluntary building sustainability standards through a wide range of nonfiscal incentives, including expedited building or zoning permits, expedited plan reviews, increased floor area ratio (FAR) and density bonuses, and permitted mixed-use development. The same range of cost-effective instruments could support a larger market take-up of standards for resilient construction.

**FIGURE 3.4 –** A range of non-financial incentives that can be used in support of voluntary standards

Key Measures	Benefits to Investor
<b>PERMITTING PROCESS IMPROVEMENTS</b>	
<b>Expedited planning, zoning, or land use approval</b>	Fast-track process for planning & zoning approvals can save substantial time and money to developers, speed up sales and strengthen cash flow.
<b>Expedited plan review of building permit</b>	Will provide the same benefit as above.
<b>Streamlined &amp; expedited building inspections</b>	This measure can take the form of a predetermined time limit [e.g. 48 hours] for the building control authority to conduct compliance checks (conformity to original building plans and compliance with building code requirements). This measure could be applied to all inspections including the final inspection in support to the occupancy permit.
<b>LAND USE CHANGES</b>	
<b>Increased floor area and density bonuses</b>	Density bonuses grant additional height or “floor area ratio” (FAR) to developers than allowed by the zoning code. Bonus density allows developers to increase floor space on projects, which in turn increase profits.
<b>Permitted mixed-use development</b>	This measure would allow exceptions in the enforcement of land use and zoning requirements and building types authorized in specific locations.



### 3.3– Conclusion

Building and land use regulation has proven to be an effective tool for risk reduction in the developed world. To date, such regulatory measures have proven ineffective in low- and middle-income countries. The recommendations in this chapter are based on the review of ineffective or failed regulation in Chapter 1 and the review of effective regulation, especially regulation that has involved solving specific problems, in Chapter 2.

The reform agenda outlined above seeks to improve the effectiveness and efficiency of building regulation, and so guide urban development to less hazardous locations and less vulnerable structures.

An effective building regulatory regime begins with the foundation of national legislation that establishes rights and responsibilities, including organizational responsibilities for the core regulatory process. This foundation must be properly designed and executed both to support the organizational structure for development and maintenance of context-appropriate codes and standards, and to facilitate code implementation at municipal and local levels.

The characteristics of successful code development processes and documents are known. The major burden of regulatory implementation and compliance falls at the local level. The recommendations in this chapter relate to administrative practice, compliance support, and procedural justice. They point to education and training for building professionals and builders, as well as advisory support to facilitate code compliance, as a valuable complement to the normal processes of review, inspection, and enforcement. Specific recommendations are directed to the efficient allocation of regulatory resources to maximize risk reduction—a process that must take into account the limited

administrative resources in low- and middle-income countries, particularly at the local level.

Though these recommendations focus on the core components of the regulatory process, it is clear that successful building regulation depends on the functioning of key supporting institutions. Investment in building professional education, building finance and insurance, and increased security of tenure can contribute significantly to code compliance and building safety.

This agenda outlined above provides the basis for a proposed Building Regulation for Resilience Program to support the development of building and land use regulatory capacity in low- and middle-income countries. That program is presented in the next chapter.

## 3.4– Summary of recommendations

1

Establish a sound legislative and administrative structure at the national level.

- |                                                                                                                                                                    |                                                                                                                    |                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1.1. Establish a legislative foundation for a building and land use regulatory authority to protect public health and safety and reduce disaster and chronic risk. | 1.2. Adopt a legal framework to support the effective enforcement of building code regulations at the local level. | 1.3. Adopt other critical legislation that contributes to compliant construction. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|

2

Develop a building code suitable to local social and economic conditions that facilitates safe use of local building materials and practices.

- |                                                                                     |                                                                                                                                   |                                                                                                                    |                                                                                                                          |                                                                                                                        |                                                                                                                                                  |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.1 Establish an open, participatory, consensus-based process for code development. | 2.2 Adopt a local building code referencing an established model code while incorporating necessary adaptations to local context. | 2.3 Develop a comprehensive building code that covers the full range of relevant construction types and practices. | 2.4 Establish building materials testing and certification laboratories that are accessible to major construction zones. | 2.5 Provide for wide dissemination of code documents and training for builders and owners based on code documentation. | 2.6 Create and maintain public awareness of basic safe construction principles for the community, building owners, and informal sector builders. |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|

3

Strengthen implementation of building code through plan review, site inspection, and permitting at the local level.

- |                                                                                       |                                                                            |                                                          |                                                                                                                                                      |                                                                             |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 3.1 Enhance compliance by applying principles of procedural justice and transparency. | 3.2 Communicate changes associated with local building regulatory reforms. | 3.3 Establish conflict resolution and appeal mechanisms. | 3.4 Provide funding and support to building departments at the local level with technically qualified and adequately compensated building officials. | 3.5 Simplify and reengineer building permitting and inspections procedures. |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|

- 3.6 Apply ICT to support increased efficiency and transparency of building control procedures.

- 3.7 Apply risk management to construction permits and inspections.

- 3.8 Apply fee levels consistent with the cost of regulatory services.

- 3.9 Leverage resources from the private sector for more efficient and effective compliance checks mechanisms.

- 3.10 Create robust accountability mechanisms around public-private partnerships in building code compliance checks.

4

To support code compliance, provide advisory services in addition to inspection and enforcement.

**4.1** Enhance the supporting role of regulatory function rather than police enforcement.

**4.2** Use regulatory capacity to coordinate training for building trades, architects and engineers, and owner-builders on improved construction techniques and code compliance.

5

Take advantage of opportunities for regulatory interventions.

**5.1** Prioritize by building function and exposure to hazards.

**5.2** Utilize public building programs as points of entry for the regulatory process.

**5.3** Exploit disaster experience to advance regulatory policy.

6

Clearly identify hazard zones and restrict development according to exposure.

**6.1** Execute hazard mapping for potential urban extension areas in advance of unregulated development to direct new settlement to safer sites.

**6.2** Reference hazard zones in building codes with emphasis on added structural requirements.

**6.3** Execute hazard mapping for existing settlement areas to establish priorities for retrofit and relocation.

**6.4** Provide infrastructure in safer areas to direct urban expansion and land use.

**6.5** Make public comprehensive information on hazard exposure and the rationale for land use management.

**6.6** Institute alternative uses to occupy hazard zones.

7

Advance supporting institutions.

**7.1** Improve regimes of tenure security to create greater incentive for compliance.

**7.2** Increase the accountability of building professionals by increasing liability regimes backed by insurance mechanisms.

**7.3** Improve the capability and accountability of regulatory agencies through quality control measures.

**7.4** Leverage housing finance mechanisms to spur investment into safer housing.

**7.5** Mobilize market demand for safer buildings.



# Programmatic Opportunities

## 4.1– A programmatic proposal in support of the *Sendai Framework for Action* agenda

This report calls for an expanded and coordinated international effort to improve regulatory implementation capacity in disaster-prone low- and middle-income countries through knowledge sharing and investment. It has established that building and land use regulation has not been effectively implemented as an essential component of disaster and chronic risk reduction in low- and middle-income countries. Disaster risk reduction will only remain an aspiration until competent regulatory regimes and compliance mechanisms are established.

In March 2015, the *Sendai Framework for Disaster Risk Reduction* reasserted the strong international consensus to act now by expanding the full

potential of effective building regulations in risk reduction. There is a largely unexploited opportunity to pool global experience from developed and developing countries at a larger scale in order to adapt lessons learned to vulnerable cities and disaster-prone areas in a selective, incremental way. This chapter outlines a proposed programmatic approach, providing a path for implementing Priority 3 of the *Sendai Framework for Action* agenda. This approach builds on the recommendations presented in Chapter 3.

Achieving risk reduction in the most vulnerable areas will considerably depend on how other development initiatives succeed in helping the poor access better and safer housing and essential services. The program would seek to build synergies with related programs such as upgrading of informal settlements, affordable housing projects, housing finance, land development and use policies, regularization initiatives, and post-disaster reconstruction programs.

A new Building Regulation for Resilience Program is outlined in this chapter. Given the evolutionary nature of building regulatory regimes, this program is primarily about initiating, and firmly setting countries on track toward accomplishing, effective reforms. Recognizing the incremental process of regulatory development, the intent of the program is to accelerate the application of scientific and engineering knowledge to building practice.

## 4.2–Program strategic goal

The strategic goal of the program is to reduce human and economic losses by limiting the creation of new risks and reducing existing risks in the built environments of low- and middle-income countries. By implementing building regulation and supporting active compliance, the program will accelerate the application of current scientific and engineering understanding to a safer built environment.

The program will provide technical assistance and support targeted investment activities with a focus on strengthening implementation capacity at the municipal level.

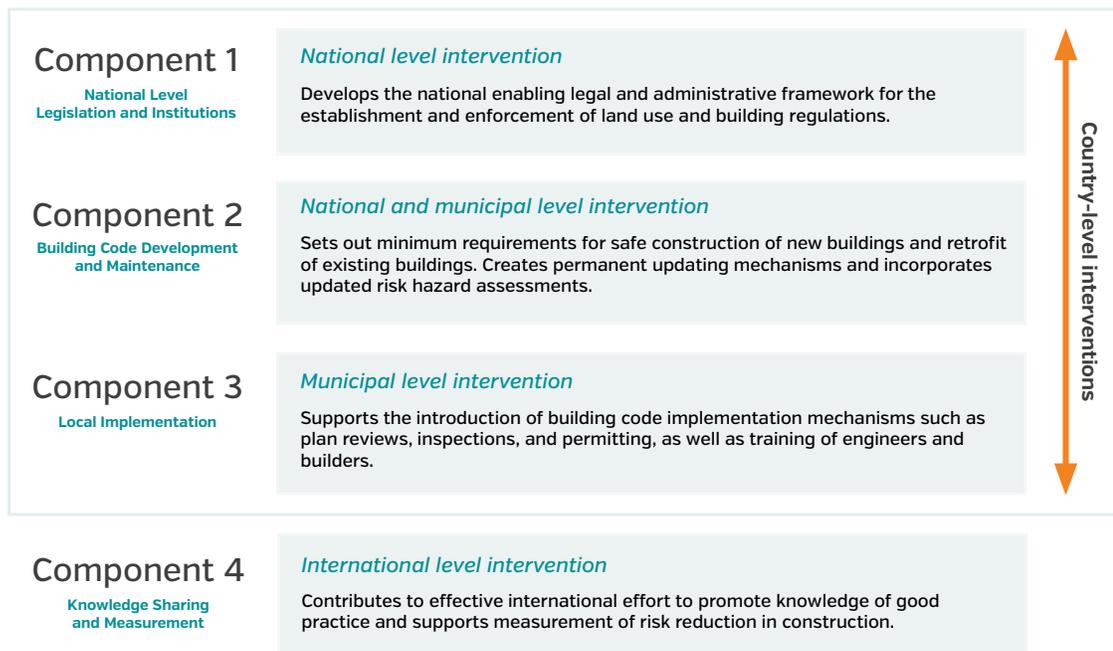
The program will be structured around four components:

1. Developing national level legislation and institutions
2. Developing, updating, and maintaining building codes
3. Investing in local regulatory implementation and compliance support
4. Maintaining strong support for regulatory reform at the international level through knowledge sharing, communications, and measurement of results

A brief description of the program components is provided in Section 4.3. Based on local circumstances, each component will focus on implementing a relevant subset of the recommendations developed in Chapter 3.

The specific recommendations under each component serve as the basis to establish a generic work program. It is anticipated that each cluster of recommendations will be modified to create a locally applicable work program that will fit the particular development needs of the national or local intervention.

**FIGURE 4.1** – Building Regulation for Resilience Program



## 4.3– Program activities and institutions

At the country level, the program will deploy Components 1, 2, and 3, which involve interdependent activities to be initiated simultaneously. Components of the regulatory regime can be strengthened in parallel at the central and local level. Country interventions will assume a three- to four-year timeline consistent with the time required to set reforms on track and complete the key recommendations from Chapter 3.

### Component 1: National Level Legislation and Institutions

Based on locally defined priorities, activities under this component will establish or improve the national legislative framework so that it can mandate the construction of safe buildings and enable the construction process to proceed efficiently. This component of the program will review national level regulations and legal provisions regarding the licensing and disciplinary oversight of the major stakeholders in the construction process. It will review the adequacy of appeals processes associated with administrative decisions made by local authorities.

Because municipalities are often funded by national governments and are not always independent in their decision making, national authorities may exert considerable influence on how municipalities allocate regulatory resources and on what mechanisms for risk management they adopt. In administratively centralized forms of governments, Component 1 will provide advice on risk management to relevant national authorities.

Component 1 is expected to support central government authorities in developing a comprehensive national coverage of hazard mapping, which is a highly specialized task with

funding opportunities often available through central government channels. Component 1 will guide the development of quality control measures set at the national level. This will then ensure that regulatory reforms are effective at strengthening building code implementation at the local level.

If there is demand, Component 1 could also include improvement to other supporting institutions through legislation; these supporting institutions include those involved in accreditation processes for building authorities, licensing of building professionals, development of liability and insurance mechanisms, and enhancement of housing finance instruments as they relate to code compliance and disaster risk reduction. The contribution of these institutions to code-compliant and safe construction would have to be reviewed.

Within this component, financial investment would aim to fund national hazard mapping programs and to expand the risk-based regulatory capacity of central authorities.

Recommendations presented in Chapter 3 help define a core development agenda under this component. They include the following:

- 1.1** Establish a legislative foundation for a building and land use regulatory authority to protect public health and safety and reduce disaster and chronic risk.
- 1.2** Adopt a legal framework to support the effective enforcement of building code regulations at the local level.
- 1.3** Adopt other legislation that contributes to compliant construction.
- 5.1** Prioritize by building function and exposure to hazards.
- 5.2** Utilize public building programs as points of entry for the regulatory process.
- 5.3** Exploit disaster experience to advance regulatory policy.

- 6.1 Execute hazard mapping for potential urban extension areas in advance of unregulated development to direct new settlement to safer sites.
- 6.2 Reference hazard zones in building codes with emphasis on added structural requirements.
- 6.3 Execute hazard mapping for existing settlement areas to establish priorities for retrofit and relocation.
- 6.4 Provide infrastructure in safer areas to direct urban expansion and land use.
- 6.5 Make public comprehensive information on hazard exposure and the rationale for land use management.
- 6.6 Institute alternative uses to occupy hazard zones.
- 7.1 Improve regimes of tenure security to create greater incentive for compliance.
- 7.2 Increase the accountability of building professionals by increasing liability regimes backed by insurance mechanisms.
- 7.3 Improve the capability and accountability of regulatory agencies through quality control measures.
- 7.4 Leverage housing finance mechanisms to spur investment into safer housing.
- 7.5 Mobilize market demand for safer buildings.

### Component 2: Building Code Development and Maintenance

Component 2 supports the development of locally implementable building codes, including the adaptation of national model codes. Activities under this component will help establish the basic institutional capacity to develop, adapt, and update appropriate standards of construction through participative and transparent processes at the national level. Efforts associated with Component 2 will engage local and central stakeholders, including scientific, engineering, and research

bodies, in an open and consensus-oriented deliberative process.

Component 2 will implement measures ensuring that hazard mapping is appropriately referenced in the local building code, and that the building code covers the full range of prevalent forms of construction (from sophisticated engineered structures to traditional and indigenous construction). Codes should address a range of building-related issues, including structural, electrical, mechanical, plumbing, fire, and energy conservation. Particular attention should be paid to criteria for evaluating and improving vulnerable existing buildings.

Under this component, research will be pursued to improve the safety of local construction methods, based on local materials and construction practices. This component will support building code implementation through the dissemination of regulatory documents as well as training for building practitioners in code-compliant design and construction. Further support will be provided to establish an adequate network of accredited facilities for testing and certifying building materials.

Direct investment under this component will involve funding of materials testing facilities and equipment, training of staff, and funding of accreditation programs of product-testing laboratories.

The recommendations of Chapter 3 relevant to this component include the following:

- 2.1 Establish an open, participatory, consensus-based process for code development.
- 2.2 Adopt a local building code referencing an established model code but incorporating necessary adaptations to local context.
- 2.3 Develop a comprehensive building code that covers the full range of relevant construction types and practices.

- 2.4 Establish building materials testing and certification laboratories accessible to major construction zones.
- 2.5 Provide for wide dissemination of code documents and training for builders and owners based on code documentation.
- 2.6 Create and maintain public awareness of basic safe construction principles for the community, building owners, and informal sector builders.

### Component 3: Local Implementation

Activities under this component will provide advice to and investment in enhanced regulatory implementation capacity at the local level. Advisory activities will strengthen the core building control functions of preconstruction plan reviews, site inspections, and permitting by leveraging new instruments described in Chapter 3. These functions will also be strengthened by improving technical outreach services to designers and builders to support code-compliant design and construction.

The objectives of the program are to limit the expansion of disaster risk in future urban development and to reduce disaster risk in existing vulnerable communities. Greater regulatory capacity for new construction will provide a foundation for extending regulatory practice to the inspection and improvement of vulnerable existing buildings. Risk reduction in existing precode settlements poses special challenges that will require an augmented building regulatory capacity and an extended period of execution. Assessment and intervention in occupied existing buildings require particular sensitivity to social and economic factors.

Concrete opportunities for direct investment include training for building department staff and inspectors to enhance both their advisory and enforcement capacity. Funding can also be directed to code-based professional training

programs for architects, engineers, planners, and buildings trades. Funding can support the procurement and installation of ICT infrastructure for online building permitting and inspection systems and, when feasible, integration into larger eGovernment services.

The recommendations of Chapter 3 relevant to this component include the following:

- 3.1 Enhance compliance by applying principles of procedural justice and transparency.
- 3.2 Communicate changes associated with local building regulatory reforms.
- 3.3 Establish conflict resolution and appeal mechanisms.
- 3.4 Provide funding and support to building departments at the local level with technically qualified and adequately compensated building officials.
- 3.5 Simplify and reengineer building permitting and inspections procedures.
- 3.6 Apply ICT to support increased efficiency and transparency of building control procedures.
- 3.7 Apply risk management to construction permits and inspections.
- 3.8 Apply fee levels consistent with the cost of regulatory services.
- 3.9 Leverage resources from the private sector for more efficient and effective compliance check mechanisms.
- 3.10 Create robust accountability mechanisms around public-private partnerships in building code compliance checks.
- 4.1 Enhance the supporting role of regulatory function rather than police enforcement.
- 4.2 Use regulatory capacity to coordinate training for building trades, architects, engineers, and owner-builders on improved construction techniques and code compliance.

- 5.1 Prioritize by building function and exposure to hazards.
- 5.2 Utilize public building programs as points of entry for the regulatory process.
- 5.3 Exploit disaster experience to advance regulatory policy.
- 6.1 Execute hazard mapping for potential urban extension areas in advance of unregulated development to direct new settlement to safer sites.
- 6.2 Reference hazard zones in building codes with emphasis on added structural requirements.
- 6.3 Execute hazard mapping for existing settlement areas to establish priorities for retrofit and relocation.
- 6.4 Provide infrastructure in safer areas to direct urban expansion and land use.
- 6.5 Make public comprehensive information on hazard exposure and the rationale for land use management.
- 6.6 Institute alternative uses to occupy hazard zones.

#### Component 4: Knowledge Sharing and Measurement

While Components 1, 2, and 3 will be deployed in specific country interventions, activities under Component 4 will expand the international reach of the program. This component will provide access to common technical, legal, and regulatory resources as well as to shared experience of regulatory implementation and common measurements of regulatory performance. It will also advance the regulatory agenda of the *Sendai Framework for Disaster Risk Reduction*.

Specifically, Component 4 will carry out diagnostic assessments of existing regulatory regimes (to establish baseline capacities) as well as risk audits (to determine baseline exposure and vulnerability). Under Component 4, standardized tools for evaluation and rating of regulatory performance, efficiency, and effectiveness will be developed, adapted, and applied. In turn, these evaluations will help to establish priorities for new project interventions to support building and land use regulatory capacity building.

Component 4 will develop a global open-source platform to regroup information from diagnostics



**FIGURE 4.2 –** Potential stakeholders of the Building Regulation for Resilience Program

	Component 1: National Level Legislation	Component 2: Building Code Development & Maintenance	Component 3: Local Implementation	Component 4: Knowledge Sharing & Measurement
Primary level of intervention	<b>National</b>	<b>National and municipality</b>	<b>Municipality</b>	<b>International</b>
Key potential partners	<p>Line Ministries (Housing, reconstruction, construction, infrastructure, etc.)</p> <p>Authorities in charge with DRR and local emergency &amp; relief agencies</p> <p>National legislative authorities</p> <p>Civil society &amp; private sector, incl. national home owners, builders, architects, civil engineering associations and developers]</p> <p>Insurance companies groupings or association</p>	<p>Local and international engineering associations</p> <p>Local private sector and industry representatives</p> <p>Local research bodies and/or university and leading local scientists.</p> <p>Building trades, including masons</p> <p>Technical institutions with experience in non-engineering sector in developing countries</p>	<p>Local government authorities, planning and building authorities</p> <p>Local emergency and relief operations</p> <p>Communities leadership, CBO &amp; NGOs</p> <p>Local private sector and industry representatives</p>	<p>Bilateral donors</p> <p>ISDR</p> <p>UN-Habitat</p> <p>UNESCO</p>

and evaluations of regulatory capacity. This information will form the baseline against which future progress may be measured.

Component 4 will consolidate knowledge and innovations in regulatory practices and provide access to a range of functioning tools for evaluation and implementation purposes.

*A focal point to serve and coordinate both local and international partners*

The Building Regulation for Resilience Program will offer the structure to involve and galvanize a wide range of partners with specific strengths and experiences in building a regulatory process. Components 1 and 2 will primarily involve national government entities and organizations. Component 3 will engage local authorities and subnational government organizations as well as NGOs, CBOs, civil society organizations, and professional groups. Partnerships will be established with international organizations across all four components with the aim of coordinating investment activities, knowledge sharing, and funding contributions consistent with the program objectives.

Figure 4.2 identifies potential stakeholders and institutional partners for the design and delivery of program intervention across all components.

### 4.4– Measuring progress

In line with the *Sendai Framework for Action* agenda, the program will carry out baseline surveys and develop indicators that will serve as the basis for targets—both qualitative and quantitative—for reducing chronic and disaster risk in the built environment.

Reducing risk depends upon the complex interaction of several variables. Direct investment in improved regulatory capacity in building departments at the municipal level, such as inspector training, must be accompanied by improvements in building professional training, materials certification, construction finance, and insurance.

The measurement of regulatory outcomes related to reducing disaster losses is complicated by the estimation of expected losses and the dynamics of future hazard exposure. Therefore, the program

will, in the near term, focus on measuring outputs and outcomes directly related to the contribution of regulatory implementation to code compliance and evidence of safer construction:

- **The development of an enabling policy and legislative framework for effective building code regimes.** This can be measured by an inventory and evaluation of legislation and policies designed to enhance building codes and code compliance.
- **The establishment of institutional capacity for the implementation of legislation, building codes, and standards.** The program will rely on outcome indicators reflecting the actual compliance with code provisions. Verification of compliance may be confirmed by third-party checks of plan reviews and site inspections.

The program plans to use a set of core indicators to measure the impacts of the program's intervention (Figure 4.3).

It should be noted that the question of how to evaluate code compliance in finished buildings

is not simple. First, key aspects of construction, such as rebar spacing, are not available for reinspection. Second, the cost of reinspection can be very significant. To minimize such costs, the program will use rapid visual screening (RVS) and statistical sampling. In the case of existing buildings, RVS surveys will be based on three parameters, exposure, vulnerability, and occupancy. The RVS is an evaluation procedure developed by the Federal Emergency Management Agency (FEMA) in the late 1980s to identify, inventory, and screen buildings that are potentially seismically hazardous.<sup>114</sup>

These indicators would serve as a starting point for measurement: the final selection of indicators would need to be well-tailored to the specific objectives and scope of country-level interventions. Experience has shown that indicators are most successful when developed by those who will use them to guide decision making. Given the relation of risk reduction to many social, economic, and development objectives, the program will ensure that measurement activities are developed

#### BOX 4.1 – What is the *Doing Business* report?

One of the farthest-reaching efforts to measure regulations was initiated by the *Doing Business* report in 2005. An annual World Bank Group publication with a powerful global media campaign, *Doing Business* provides objective measures of business regulations in 189 economies and selected cities at the national and subnational level. The report creates a ranking for each country and spotlights “reforms” and new “best practices.” Its release is frequently accompanied by a spirited debate among its staunch supporters and opponents.

In the past 10 years, the report has measured the ease of “dealing with construction permits” and counted a total of 170 related reforms across the globe. Most of these reforms were actually catalyzed by *Doing Business*, which builds upon the visibility and competitive pressure surrounding its publication.

Since its inception, *Doing Business* has ignited a new focus on building code implementation. The report puts pressure on governments to remove costly inefficiencies, thus shifting the attention to downstream implementation issues of building codes, with a focus on building permits procedures and municipal inspections. In terms of success and extent of usage, no other instrument has done as much to encourage political leaders and regulators in developing countries to improve their construction standards, simplify procedures, and reduce compliance costs.

The “dealing with construction permits” indicator will be expanded in *Doing Business 2016* to include an index measuring good practices in construction regulation. This volume will also assess the quality control and safety mechanisms in place for construction permitting systems, as well as the quality of building regulations. Data on these new criteria were collected for 170 countries in a trial phase in 2014.

in a participatory manner that encourages a broad ownership and maximizes commitments to reforms.

### Measuring interim accomplishments

In order to set baselines and targets, define reform priorities, and measure progress on interim accomplishments, the program will make use of at least two sets of data:

- *Doing Business's* annual survey referencing construction permit indicators would provide measurement on general aspects of building regulatory administrative efficiency (Box 4.1). The same survey is now being extended to

include indicators that reflect the influence of local building code implementation on actual risk reduction in buildings. Starting in 2016, the report will present an additional index assigning higher scores to jurisdictions with more practices such as third-party verifications, final inspections of buildings, and qualifications requirements for engineers.

- An evaluation and benchmarking methodology will be developed to capture more detailed building regulatory processes and effectiveness indicators. This will make it possible to assess more comprehensively the contribution of building code implementation to actual disaster risk reduction and resilience.

**FIGURE 4.3** – Core indicators of progress and impact

#### Output Indicators

- Number of laws and regulations drafted or revised to support effective implementation of building code systems
- Number of building departments with adequate funding and qualified staffing
- Number of accredited professional training programs for building department inspectors and building professionals
- Value of financial investment in municipal building control capacity
- Number of formally certified inspectors
- Ratio of qualified building department staff to volume of construction to be reviewed and inspected
- Percentage of districts with comprehensive hazard assessment and mapping
- Number of existing buildings surveyed and evaluated for disaster resilience capacity
- Percentage of districts with hazard zonation defining permitted land uses
- Number of programs of training sessions on code compliance for owners and builders, including the informal sector
- Number of programs of public information on the purpose and implementation of building and land use regulation

#### Outcome Indicators

- Percentage of new construction built in compliance with building code requirements
- Number of people benefiting from reduced risks in the built environment
- Number of cities and related populations served by effective building regulatory functions of plan review and on-site inspection
- Rate of deaths and injuries as a result of fire, structural collapse, or other defects in new regulated buildings relative to the size of building stocks
- Survey-based estimates of percentage of nonconforming buildings relative to the size of building stocks
- Percentage of schools sited and designed to withstand hazard loads
- Percentage of health facilities sited and designed to withstand hazard loads
- Percentage of existing (pre -code) buildings assessed for potential disaster resilience
- Percentage of existing vulnerable buildings retrofitted to withstand hazard loads
- Number of code infractions identified and adjudicated
- Number of hazardous buildings condemned and removed
- Number of professional certifications revoked
- Number of code violations cited

# Conclusion

Building and land use regulation has proven to be the most effective tools for reducing disaster and chronic risk in the developed world. For a range of reasons discussed in Chapter 1, low- and middle-income countries have not successfully employed these tools. With the initiation of the *Sendai Framework for Action*, there is now an opportunity to reengage in the challenge of reducing disaster and chronic risk in low- and middle-income countries. This new effort is armed with extensive experience and innovative approaches. Focused attention on the building and land use regulatory capacity of disaster-prone countries and municipalities can ensure positive outcomes. For example, future construction and urban expansion will take place on safer sites. Structures will be built to protect population health and safety, and disaster risk will be reduced. Building regulation can work as a catalyst to leverage the total investment in building and infrastructure toward greater safety and security.

By implementing building regulation and supporting active compliance, the proposed Building Regulation for Resilience Program can serve to accelerate the application of current scientific and engineering understanding to a safer built environment.



# Endnotes

- <sup>1</sup> UNISDR 2012.
- <sup>2</sup> UNISDR 2015.
- <sup>3</sup> UNISDR 2015.
- <sup>4</sup> Munich Re, NatCat Service, 2013, <http://www.munichre.com/en/reinsurance/business/non-life/georisks/natcatservice/default.aspx>.
- <sup>5</sup> Kenny 2009.
- <sup>6</sup> World Bank 2014.
- <sup>7</sup> Bilham and Ambraseys 2011.
- <sup>8</sup> UNISDR 2015.
- <sup>9</sup> Yanev 2010.
- <sup>10</sup> World Bank 2013.
- <sup>11</sup> IFRC and UNDP 2014.
- <sup>12</sup> Munich Re, 2010 data.
- <sup>13</sup> World Bank and United Nations 2010.
- <sup>14</sup> Lewis and Purcell 2015.
- <sup>15</sup> da Silva 2013.
- <sup>16</sup> Further referred to as “HFA 2 agenda”.
- <sup>17</sup> UN General Assembly 2014.
- <sup>18</sup> Bilham 2009.
- <sup>19</sup> IPCC 2014.
- <sup>20</sup> Brecht, Deichmann, and Wang 2010.
- <sup>21</sup> GFDRR.
- <sup>22</sup> UN-Habitat 2014.
- <sup>23</sup> Kellett and Caravani 2013.
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- <sup>31</sup> Shifting Agendas The Role of Engineer in Disaster Risk Reduction, Jo da Silva, 2012 [LSE Cities public lecture in partnership with OveArup Foundation].
- <sup>32</sup> Why do People Die in Earthquakes? The Costs, Benefits and Institutions of Disaster Risk reduction in Developing Countries, Kenny, 2009.
- <sup>33</sup> From Everyday Hazards to Disasters: The Accumulation of Risk in Urban Areas, Bull-Kamanga, 2003.
- <sup>34</sup> Adelekan et al. 2015.
- <sup>35</sup> Disaster Risk Reduction: Cases from urban Africa, Pelling & Wisner 2009.
- <sup>36</sup> <http://www.theguardian.com/news/datablog/interactive/2013/sep/03/india-failing-2651-deaths-structural-collapse-architecture-housing>.
- <sup>37</sup> Johnson, 2011.
- <sup>38</sup> Thirkel, 1996.
- <sup>39</sup> The CAPRA program is an initiative that aims to strengthen the institutional capacity for assessing, understanding and communicating disaster risk, with the ultimate goal of integrating disaster risk information into development policies and programs.
- <sup>40</sup> UN-Habitat, Secure Land Rights for All, 2008.
- <sup>41</sup> Commission on Legal Empowerment of the Poor Making the Law Work for Everyone, Volume 2, Working Group Reports – <http://legalempowerment.undp.org/reports>.
- <sup>42</sup> Payne.
- <sup>43</sup> Towards a National Building Code, Eng. Noel daCosta, no date.
- <sup>44</sup> Yahya et al, 2001.
- <sup>45</sup> Disaster Risk Reduction in Turkey: Revisions for Land use Planning, Development and Building Code Enforcement since 1999, Gülkan, 2010.
- <sup>46</sup> Blondet, M. and G. Villa Garcia M. Adobe construction. Available online at: [http://www.world-housing.net/wp-content/uploads/2011/06/Adobe\\_Blondet.pdf](http://www.world-housing.net/wp-content/uploads/2011/06/Adobe_Blondet.pdf).
- <sup>47</sup> Blondet, M. and G. Villa Garcia M. Adobe construction, op cit.
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- <sup>55</sup> A clear correlation exists between a nation's per capita income and the level of corruption, Ambraseys & Bilham, 2011.
- <sup>56</sup> "Corruption Kills", Ambraseys & Bilham, 2011.
- <sup>57</sup> Transparency International Bribes Payer Index, 2011.
- <sup>58</sup> Olken, 2004.
- <sup>59</sup> Transparency International Global Corruption Report, 2005.
- <sup>60</sup> Kenny, 2007.
- <sup>61</sup> Clientelismo Y Desarrollo Barrial en Bogotá: Analisis a Partir Del Caso Del Barrio Cerro Norte, Aunta Peña, 2009.
- <sup>62</sup> World Bank Enterprise Survey.
- <sup>63</sup> <http://beeps.prognoz.com/beeps/Home.ashx>.
- <sup>64</sup> EQI International.
- <sup>65</sup> Ambraseys, Bilham, 2011.
- <sup>66</sup> Referred to as "D595" promulgated on April 10, 2000.
- <sup>67</sup> Disaster Risk Reduction in Turkey: revisions for Land Use Planning, Development and Building Code Enforcement Since 1999, Gülkan, 2010.
- <sup>68</sup> Data is unfortunately often not available or not comparable for construction related safety issues – and the relatively low frequency of accidents makes it difficult to build meaningful comparisons, hence our reliance on fire safety statistics as a proxy.
- <sup>69</sup> This observation is in now measure limited to the Former Soviet Union nor should it be understood that we are singling out these countries – they were chosen because of data availability and because they have meaningful regulations on the books which if implemented appropriately should ensure a better level of safety.
- <sup>70</sup> International Finance Corporation, 2015.
- <sup>71</sup> Doing Business, 2015.
- <sup>72</sup> Doing Business, 2015.
- <sup>73</sup> Ecole Nationale des Ingénieurs Abderhamane B.Touré founded in 1963.
- <sup>74</sup> Doing Business Report database, 2015.
- <sup>75</sup> Munich Re, 2013.
- <sup>76</sup> This definition extends the traditional definition of the term since the World Bank generally defines "risk" as a function of hazard, vulnerability and exposure. Consideration of "social consequences" provides an important element to better grasp and determine the relative notion of acceptable risk.
- <sup>77</sup> To allow consistent comparisons, Doing Business records the cost required for a small medium-size business to obtain all necessary approvals to build as simple commercial warehouse and connect it to sewerage and water. The warehouse is assumed to have two stories, both above ground, with a total constructed area of 1,300 square meters). Each floor is three meters high.
- <sup>78</sup> The term "applicable laws" refers to laws, regulations, and bylaws which would prohibit construction unless complied with. For example, an applicable law could include provisions that prohibit high-rise buildings in certain locations near runways and airports, or that regulate construction in floodplains or agricultural areas.
- <sup>79</sup> Doing Business Report, World Bank Group, 2015.
- <sup>80</sup> Doing Business records the procedures, time and cost required for a small-to-medium-size business to obtain all necessary approvals to build a simple commercial warehouse and connect it to water and sewerage systems.
- <sup>81</sup> World Bank, 2013.
- <sup>82</sup> Illustrating this point: the work of Becker [1968], Allingham and Sandmo [1972] and Srinivasan [1973] in the field of tax compliance.
- <sup>83</sup> "The Economic Psychology of Tax Behaviour", Kirchler, 2007.
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- <sup>87</sup> Managing and Maintaining Compliance", Elffers, Verboon, Huisman, 2006.
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- <sup>90</sup> Building Resilience, WB, GFDRR, 2013.
- <sup>91</sup> Guidebook for Building Earthquake-Resistant Construction of one to Two-Storey Buildings in Confined Masonry, Revised June 2015.
- <sup>92</sup> Pierson Lester, 2014.
- <sup>93</sup> [www.doingbusiness.org](http://www.doingbusiness.org).
- <sup>94</sup> How Transparent is Business Regulation Around the World, Geginat 2013.
- <sup>95</sup> Best Practice Ingredients for Building Regulation, NSW/ACT Chapter Conference in Sydney, Kim Lovegrove, 2013.
- <sup>96</sup> Reforming Building Permits, IFC, 2009.
- <sup>97</sup> Ministry of Housing, Ontario, 2009.
- <sup>98</sup> International Finance Corporation, 2015.
- <sup>99</sup> Doing Business Report: data aggregated for the 2006-2014 period.
- <sup>100</sup> This regime was implemented in April 2013.
- <sup>101</sup> Doing Business Report, World Bank Group, 2015.
- <sup>102</sup> Building Regulatory Enforcement Regimes, Jeroen van der Heijden, 2009.
- <sup>103</sup> To this effect, Victoria established a private-public "Building Practitioners Board", an independent organization which oversees the quality and standard of the State's building industry professions.
- <sup>104</sup> The "curadores" were legally established in 1995 as certified individuals delegated with the public responsibilities to administer building permit reviews and to issue permits. Curadores set up shop and were in full operation by January 1996. Initially, curadores were selected among experienced architects and engineers with construction experience.
- <sup>105</sup> Initiated by the Field Act, shortly introduced after the earthquake with other laws, that banned the

construction of unreinforced masonry buildings, and required that earthquake forces be taken into account in structural design.

- <sup>106</sup> A Financial Framework for reducing Slums: Lessons from Experience in Latin America, Ferguson, Navarrete, 2003.
- <sup>107</sup> Property Rights for the Poor: Effects of Land Titling, Galiani & Schargrodsky, 2010.
- <sup>108</sup> Kagawa 2002.

<sup>110</sup> Good Practices for Construction Regulation and Enforcement Reform, World Bank, 2013.

<sup>111</sup> Based on report from Doug Martin, Crown Manager appointed to the Christchurch City Council after the IANZ withdrew its accreditation to the city's BCA, March 2015.

<sup>112</sup> Housing Finance Policy in Emerging Markets, Loic Chiquier, Micahel Lea, 2009.

<sup>113</sup> Turkey Green Buildings Market Study, IFC, 2013.

<sup>114</sup> FEMA 2015.

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Over the past two centuries, effective building and land use regulation have dramatically reduced incidences of urban conflagration and epidemic disease. In the developed world, such regulation has resulted in successful risk reduction and hazard response adaptation. However, disaster risk reduction strategies for low- and middle-income countries have largely ignored building and land use regulation. Furthermore, experience has demonstrated that the simple transfer of building codes from highly developed to developing countries is often counterproductive. A review and analysis of regulatory experience must be better applied to the creation of regulatory capacity in developing countries. Knowledge must be appropriately adapted to local conditions and incorporated into methods of sustainable regulatory implementation.

This publication provides an analysis of available evidence to identify practical measures for increasing the effectiveness of building code implementation. Focusing on low- and middle-income countries, the authors argue for increased investment in functional building regulatory and governance systems for disaster risk reduction, while advocating a practical reform agenda for global collaboration.

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The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 local, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 34 countries and 9 international organizations.

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