13th World Conference on Earthquake Engineering
Vancouver, B.C., Canada
August 1-6, 2004
Paper No. 1824

URBAN EARTHQUAKE RISK REDUCTION FOR THE 21ST CENTURY: The Way Forward for the Middle Income and the Low Income Countries

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SUMMARY

Recovery and reconstruction experiences following major earthquakes in developing countries have highlighted the need for re-examining strategic approaches to preventing earthquake disasters happening in the densely built urban environment. Given the evidence that poor residents of low income countries are disproportionately more seriously affected by earthquakes, other natural disasters and extreme events than their more affluent neighbors, it is proposed that the *ad hoc* approach to urban earthquake prevention give way to a more concerted, systematic and sustainable seismic prevention in the urban areas of the poor (low income) and middle income countries. As disaster vulnerability is closely related to development, this paper proposes strategies for earthquake prevention in the cities of these two categories of developing countries, as urban susceptibility to earthquakes may jeopardize in the long term, and sometimes even reverse, the results of the development process. At the onset of the new millennium and the global quest for poverty reduction, two strategic urban earthquake prevention approaches, deeply linked to the development process, are proposed for the middle and low income developing countries, respectively.

MIDDLE AND LOW INCOME COUNTRIES IN DISASTERS

The new millennium has brought new hopes and aspirations for the global well-being, such as the achievement of development goals by year 2015, which would halve the world poverty levels by year 2015 (UN, 2000). But the new era has also affirmed the entrenched presence of recent global threats (for example, HIV / AIDS), and brought in the realities of such calamities as international terrorism. Conversely, the old malaises, such as tuberculosis and malaria, are again rising their heads, while natural hazards are calamities that do not subside: Munich Re reports that in 2003 about seven times more lives were lost to earthquakes, heat waves and tornadoes than in the preceding year (Reuters, 2004). Despite the enormous efforts and positive scores in development globally, the gap between the “haves” and the “have nots” is increasing in many countries. Poverty lies at the root of earthquake vulnerability (Pantelic, 1991) and is closely related to the level of development. The more resources are diverted to reacting to natural hazards, the less are applied to growth, poverty reduction and development.

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Recent Disaster and Earthquake Trends

Underpinning disaster trends of 2003, several previous years have also seen the severity of disasters on the rise. Quoting the 1999 Munich Re figures, Freeman (2000) indicates that the number of global catastrophes increased five-fold, while damage grew by a factor of nine if contrasted to the decade of 1960s. The 2001 World Disaster Report indicates that the annual average number of people affected by disasters has risen to 211 million from 147 million in the previous decade. Floods, droughts and windstorms affected the greatest numbers of people in the last decade, with 68 percent, 18 percent and 12 percent, respectively. Droughts and famines caused 37 percent of all disaster-related life loss between 1991 and 2000, followed by 27 and 13 percent of people who lost their lives in wind storms and floods, respectively (IFRCRCS, 2001). In 2001, earthquakes affected 19 million people, more than any other year of the previous decade, and accounted for over a half of the year's death toll (IFRCRCS, 2002). The trend continued in 2003, when in December close to 50,000 people died in Iran's Bam earthquake, and in May almost 3,000 perished in the Algeria's earthquake of Boumerdes.

Vulnerability of Middle Income and Low Income Countries: Poverty and Earthquakes

Policies, institutions and governance are key variables in alleviating poverty: as Dollar and Pritchett (1998) found in their study of aid effectiveness and poverty reduction in developing countries, the better the country's performance in these areas, the more effective the aid in poverty reduction. Low income countries (LICs)[1] are characterized by weak institutions, policies and governance, and financial aid to them has, by and large, been insufficiently effective. Middle income countries (MICs) comprise about 80 percent of the population of developing countries and about 90 percent of their gross domestic product. They have better policy environment, stronger institutions and governance, and while these indicators surpass those in low income countries, they are home to about 70 percent of developing countries' poor (counted as those who live on a $1-a-day). As Linn pointed out in 2001, MICs are more diversified and integrated with the world economy and have a better growth potential, but because of their greater integration into the world economy, they are also subject to greater volatility and the risk of rapid increases in poverty. Earthquakes and other extreme events only add to their overall vulnerability – as examples, one can only think about the urban seismic risk of MICs such as Turkey (Istanbul), India (Ahmedabad), Mexico (Mexico City) or China (Beijing).

Albala-Bertrand (2003) argues that disasters may be a "problem *of* development, but not necessarily a problem *for* development." He suggests that in the medium- and long-term, macroeconomic effects of disasters, earthquakes included, appear to be minor or negligible. Public deficit may rise as a result of government's spending on financing reconstruction and recovery, but this phenomenon rarely persists in the long-term. In addition, reconstruction and business development during the first few post-disaster months and years may even spawn short-term economic growth. This notwithstanding, social and economic costs sustained by the poor segments of the society and low-income communities in general, remain high – irrespective on the internal capacity of the economy to rebound quickly.

While this argument holds true for the industrialized and the majority of middle-income countries, it clashes with the reality of low-income countries. When affected by significant extreme events – including earthquakes and other natural hazards, global price fluctuations of main export commodities, the impact of

[1] Especially Low Income Countries Under Stress (LICUS) (World Bank, 2002).

the oscillations of the global economy, or civil unrest in neighboring countries – poor countries' economies, as well as their predominantly poor residents, tend to be excessively more affected than the more affluent countries or social groups. The severity of impact of extreme events on low income countries, such as those triggered by natural hazards, are closely linked with growth and development: the tragic loss of life and the exorbitant financial and economic costs caused by an earthquake, can rarely be expected to be offset in low income countries by the arguably positive influences that may follow, such as external aid and / or international loans. Following Dollar and Pritchett's (1998) argument, limited absorptive and institutional capacity levels of low income countries may preclude effective recovery, help seal-in adverse disaster impacts, and in some cases, even reverse the positive effects of a previously successful development phase.

CITIES AND THEIR VULNERABILITY

Cities have traditionally been major contributors to the growth of their countries' economies. Today's urban areas are home to more than one half of global population and urbanization rates are accelerating. The number of urban residents in the developing world is likely to double in the next generation, increasing by over 2 billion inhabitants. Cities are also principal generators of social, economic and financial wealth. Between half and four-fifths of GDP in most countries is created in cities. With political and fiscal decentralization, cities are also arenas of innovative local governance transition, enjoying more political and economic power (Kessides, 2000). Both public and private investment in cities surpass that in the rural areas.

These major contributions notwithstanding, cities are also home to a growing number of the poor. For example, despite their high contribution to the city economy in real terms, close to 60 percent of more than 13 million residents of Mumbai, India, live in unsanitary, illegal slums. Cities also have historical experience in dealing with complexity and uncertainty, the good example of which are extreme events – such as earthquakes, floods, fires, or industrial accidents – which can disrupt their growth. Especially in the developing world, cities are internally, on the institutional (or "soft") side, subject to national governments' policy decisions and regulations which can facilitate or slow down that growth. On the physical ("hard") side, cities are places of overcrowding, traffic congestion, concentration of waste, air and water pollution, poor maintenance and over-utilization of most of its assets and infrastructure, especially water supply, sanitation and transport. Housing problems in particular become overwhelming, leading to many social and physical vulnerabilities. While these problems may remain hidden (or become tacitly accepted) in the dynamism of "normal" urban daily life, they tend to get revealed when extreme events strike. Earthquakes are particularly deadly in their sudden onset, unpredictability and high social, financial and economic costs. If left unprepared to earthquake devastation, cities can crumble and the contribution to their own and their countries' economies can be brought into question or to a halt. Preventing the disastrous consequences of urban earthquakes has become paramount to sustaining cities' growth in both middle and low income countries.

Disasters and the Poor

The poor living in low income countries, as well as the significant "pockets" of the poor living in middle income countries, are disproportionately affected by earthquakes and other extreme events (Pantelic, 2003). Urban poor carry particularly high burden of exposure to earthquakes and other extreme events. The World Disaster Report of 2001 reminds us that 97 percent of all disaster-related deaths occurred in the developing countries, while only two percent took place in the industrialized societies (IFRCRCS,

2001). Moreover, as a percentage of GNP, disaster losses in developing countries are an estimated 20 percent higher in developing than in developed countries (Anderson, 2000 and 1990). Only two percent of all the people who are affected by disasters every year live in highly developed countries. In contrast, about 90 percent of them reside in the middle- and low-income countries (mostly in Asia), one of the most disaster-prone continents (IFRCRCS, 2001). The poor – especially in mega cities – pay excessively for the meager services they obtain in non-disaster times – and they also overpay in the times of disaster with their lives, livelihoods and loss of shelter .

DISASTER PREVENTION STRATEGIES FOR THE CITIES IN MIDDLE AND LOW INCOME COUNTRIES

Growth and countries' resilience to disasters, such as those caused by earthquakes, are closely correlated. Low income countries commonly do not have access to foreign exchange reserves that can help them "cushion" the financial, economic and social costs of such unexpected extreme events. Moreover, these countries may also be weakened by reduction in growth that is not related to natural hazards – such as regional wars or economic downturns. As these countries usually have an uncommonly high share of the poor amidst explosively growing cities, with inadequate access to basic urban services (water, sanitation, housing), they tend to suffer long-lasting macro-economic effects. As already indicated, weak policy environment, institutions and governance tend to amplify the adverse impacts of earthquake destruction in poor countries.

While middle income countries, too, belong to the group of developing countries with high incidence of poverty, their institutional, administrative and, importantly, fiscal capacity are usually stronger than those of their low-income neighbors. They have various options to choose from, in order to steady their course after a particularly strong extreme event, such as an urban earthquake. In addition to their own reserves, possibly insurance claims, direct bilateral assistance and loans from international financial institutions, these countries can also choose to access private sources of borrowing. As indicated by Albala-Bertrand (2003), while the poor in all countries suffer after devastating earthquakes and experience the tragedy of losing family members, jobs, roofs over their heads, and other opportunities, these experiences are by and large confined to individual community levels, the "pockets" of destruction and suffering, to which the middle income country governments can, and almost invariably, respond.

Bearing in mind the differences in long-term implications of major urban earthquakes for middle and low income countries, it must be underscored that extreme events of this nature produce generally *ad hoc* responses in both groups of countries. Faced with a long list of competitive items on the development agenda (health, education, basic infrastructure – to name a few), rare is the government of a developing country that chooses to invest into disaster prevention *before* an earthquake strikes. Rather, the action is taken *after* a disaster has taken its toll, and revealed the weaknesses in both the physical and the institutional environment. The inevitably heightened awareness after these events of the policy-makers on the one hand, and the constituents (victims), on the other, frequently serves as an opportunity for developing *systematic* earthquake prevention approaches, that would be aligned with the particular needs and resources of the country in question.

Given the documented frequency and severity of earthquake destruction in urban environment of developing countries and the vulnerability of their urban poor, both middle and low income countries need to move away from the largely *ad hoc*, after-the-fact response to earthquakes and other extreme events, to a pre-disaster *systematic* hazard reduction approach that would include a strong dividend of disaster prevention. It is proposed that, while the goal remains the same for both groups of countries – reducing urban earthquake hazard and achieving disaster prevention – the two groups of countries require different approaches to earthquake prevention. Each of the two approaches must adequately reflect the inherent constraints and advantages of either *group of countries*, and allow for the incorporation of *individual countries'* discrete institutional, political, social and economic characteristics. This is necessary in order to achieve countries' ownership and effectively link development outcomes with urban earthquake risk reduction. The following section examines knowledge (including awareness raising), access to financing, and policy, institutional and governance arrangements, as they relate to earthquake hazard reduction in middle and low income countries.

Earthquake Hazard Reduction Scenario for Middle Income Countries

It was demonstrated that macro-economic effects of major earthquakes and other extreme events on MICs are absorbed within a relatively short period of time, but that the suffering and losses are great within impacted poor communities of these countries. On the premise that technical knowledge, and some fundamental policy, institutional and governance arrangements might already be in place (or are on the right way to being developed), the key for mainstreaming earthquake hazard reduction and disaster prevention in middle income countries becomes political commitment, decisions on accessing financing sources on adequate terms and awareness raising.

Following disasters, awareness of both policy-makers, appointed officials and the political constituents (the "public at large") is high, so these moments must be strategically used for introducing the long-term, systematic, and hazard reduction mainstreaming agenda. Under the pressure of public opinion, a recognition and the commitment by the government to develop systematic earthquake hazard management processes with a goal of preventing future disasters and the loss of human life, public and private property, is a critical step in the right direction. Hence, disasters must be used as opportunities for mainstreaming hazard reduction into a regular development process. For example, this is the approach taken by the Algerian authorities after the 2003 Boumerdes earthquake, or their Indian counterparts after the Bhuj, Gujarat earthquake of 2001, or indeed by Turkey, after the 1999 Marmara earthquake. Revising, if necessary, regulatory framework on planning (including land use, urban development, earthquake preparedness, mitigation and response), construction laws and practices, licensing of contractors and developers, committing to adequate funds for regular operation and maintenance of critical public infrastructure, taxation, disseminating transparently to the general public hazard information, what can be done to prevent losses and save lives, and governments' plans for avoiding future catastrophes, are all part and parcel of this process.

A more difficult, but not impossible proposition for MICs is to embark upon a process of earthquake hazard prevention *before* a disaster strikes, *without* the "incentive" of already sustained losses and the pressure of public opinion. The incentives in this case must be sought in the *quantifiable results* of risk analyses, earthquake loss estimation studies, stock-taking of the relevant sections of the policy and regulatory systems, examination of institutional and cross-sectoral linkages, and governance arrangements. How much would it cost to lose the productive capacity of a key industry, vs. pre-earthquake investment into loss prevention? What would be the social, financial and economic cost for city (especially a mega-

city) to suffer critical losses, in contrast to preventive investment before a disaster strikes? How much does it cost to retrofit schools, fire stations, hospitals, government buildings?

It is proposed that strategic and systematic stock-taking of earthquake exposure (and that to other possible extreme events) be coordinated on the country ("central") level, but that decentralized local governments take on pro-actively their implementation as appropriate for the dominant risks in their jurisdictions. This method has already been used to its advantage in industrialized societies – for example, the Association of Bay Area Governments (ABAG)[2] indicates that "mitigation guidelines may be developed centrally, but […] their implementation [is] the responsibility of local governments" (2001). The US National Earthquake Hazard Reduction Program (NEHRP) is also developed along the same lines.

This approach is particularly suited for the cities in countries that have some experience in successful decentralization of fiscal arrangements, and complementary frameworks between governmental levels. It calls for a good synchronization between the central and local governments, functional division of administrative responsibilities, accountability between governmental levels, clear fiscal responsibilities and arrangements, as well as a solid level of institutional and human resource capacity. The private sector, on its own and through public-private partnerships (PPPs) would also have a critical role to play. The competition between private and public sector in the areas suitable for private sector involvement should be discouraged so that the latter does not suffer from being crowded out.

Codes and bylaws that govern land-use planning, zoning, architectural, urban and engineering design should be examined and preferably performance- rather than prescriptive-based regulatory frameworks should be modified to the state-of-the-art level or adopted anew. Consistent comparison of losses that could be incurred if preventive measured were not applied, with the savings if they were employed, would have to be put in place. Implementation and application of an earthquake hazard prevention agenda would have to be backed by the central government, but owned and implemented by local and state / provincial governments. Strong participation of the members of the civil society, chambers of commerce, trade associations, NGOs and others is critical for moving forward, as has been amply demonstrated from the examples of implementing hazard reduction strategies in countries like the US or Japan. Supervision, monitoring and enforcement of codes should be incorporated into the overall development process, integrated into the agenda of relevant ministries, departments and municipal authorities, rather than be launched as stand-alone, "disaster-related" operations.

Access to technical knowledge can be facilitated through private sector and the members of civil society, especially the academia. Access to financial resources depends on the assessment of the central government as to what resources are available, and their conscious decision to self-finance or borrow for this purpose from international finance institutions or on the private market, or use other instruments. Existence of insurance instruments in the country and its ready availability would deal with the problem of cash flow for community recovery after disastrous events. If properly planned, the urban poor would likely find an access to targeted loans, upfront grants from the government for housing reconstruction, rather than loans with subsidized interest rates that would distort country's established internal borrowing systems.

[2] ABAG convenes local governments of the San Francisco Bay Area.

Municipal and other local and state / provincial governments would be able to compete for earthquake prevention resources, which could, *inter alia*, come from international community – sometimes as grants, or in the form of loans either directly taken by local governments on the private market (in the cases of particularly financially strong municipal governments), or guaranteed by the central government. Similarly, should the conditions for insurance exist, central government should at a minimum take on the role of a regulator. A high degree of local independence within the framework of central government's enabling regulatory environment has proven its worth in industrialized societies. It is only when the capacity of the local community is fully exhausted by a major disaster that the central government should be invited for assistance (carrying with it, if appropriate, international assistance as well).

Earthquake Hazard Reduction Scenario for Low Income Countries

As illustrated above, and in contrast to most MICs, low income countries by and large have no means – institutional, policy or governance – to meet the urgent needs occasioned by sudden earthquakes that devastate their major cities and engines of national growth. Additionally, they may have no access to internal financing for the recovery and reconstruction which would also include prevention against future catastrophes. Moreover, in between damaging earthquakes, these usually heavily indebted countries which also and face deep fiscal constraints and enormous development agenda – ranging from lack of essential urban services such as clean water and sanitation, safe roads, and job generation, to education and basic health issues with prominent HIV / AIDS challenges – rarely have the luxury of investing into prevention today that may yield benefits tomorrow.

Nonetheless, low income countries probably need the most pro-active, pre-disaster prevention planning in order to minimize country-wide and economy-wide reverberations of earthquake disruptions when they do occur; when key cities with large concentration of the poor, with inadequate access to basic services sustain major damage in earthquakes; when investments gains from previous years tend to be obliterated in a matter of seconds, divert development resources and likely cause the reversal of earlier achievements; when fiscal reserves are close to non-existant and earlier debt becomes a major constraint to further borrowing; when insurance culture and mechanisms do not exist and are not likely to be espoused nor established in the near future; when scores of dead need to be unearthed, the injured provided with emergency medical assistance in the shortest possible time and when tens of thousands are left homeless, without shelter, food and water; and when resources must be found urgently to initiate reconstruction and recovery along more sustainable lines.

Decentralization and the participation of the private sector should not be shunned in low income countries, but the usually very low capacity levels may put significant constraints to the extent to which the capacity of local (as well as central) governments can be put to effective use.

Essential knowledge of risks to urban environment and its productive capacity may exist both with some of the policy-makers, and the public at large, especially the academia, potentially creating an environment for ownership of a hazard prevention agenda among the key stakeholders. While international technical knowledge and operational expertise might be scarce locally, community, home-grown and pertinent know-how may be abundant – such as knowledge of relying on extended family and friendship systems, access to local micro-finance, or experience of working with NGOs. In the context of a low public institutional capacity, this situation suggests the use of "participatory governance" (Bonaglia and

Fukasaku, 2003). Participatory approach to policy design and implementation are its main characteristics that have seen successful application in countries such as Bangladesh (in the context of cyclones and floods) or Mauritius (regarding trade and investment promotion). Similar approach for earthquake hazard reduction that would rely on a broad-based civil society and private sector, with government as facilitator in a unique partnership, would have opportunities for effective community involvement.

In the age of globalization, technical knowledge can be made accessible to all, even the poorest of the low-income countries. However, the reality is that for the poorest and the most vulnerable LICs the access to *development* assistance during recovery period is not a matter of choice but a dire need: it spans the early emergency response period and humanitarian aid; emergency sheltering and housing[3] periods; permanent housing and infrastructure reconstruction; social, economic and financial recovery, accompanied by social safety nets, job generation activities, incentives for the involvement of the private sector (e.g., support to and development of small and medium-sized enterprises); and the regulatory stage, standardizing legal aspects of earthquake-resistant urban development and construction. The central government must remain involved throughout the steps of the process just described as a guide to the process; as a coordinator and a conduit of national, regional and international expertise and assistance; and, if necessary, as an active participant in implementation. While the participation of local (affected) communities, civil society in general and non-governmental organizations is a *sine qua non* of any sustainable recovery, the participation of the government, fledgling private sector (if applicable), and well coordinated bilateral assistance organizations and multilateral finance institutions is of paramount importance for low income countries. Given the usually high level of foreign debt of LICs, judicious availability of grant assistance and affordable loans can make a difference in assisting the poor countries reach the high bar of pre-earthquake hazard prevention through a regular development process, and minimize the likelihood of traumatic exposure to future extreme events.

CONCLUSIONS

The proposed scenarios for urban earthquake hazard reduction for the middle and low income countries respectively, rely on the differences between these two groups of countries in policy, institutional and governance arrangements, and knowledge – either global / technical, local / indigenous – or a blend of both. Hazard awareness is a significant factor in ensuring political backing and support, commitment of the key stakeholders, and eventually access to financing. While middle income countries have more choices available in that respect, poor countries are heavily constrained by their own fiscal situations and heavy indebtedness. International financing institutions and bilateral donors can make a difference to both groups of countries, which collectively are home to the majority of world's poor. While MICs need leveraging of their financial and other resources, facilitation of international development institutions and reliance on their own (even if imperfect) policy, institutional and governance environments, LICs have a much harder internal situation to deal with. Reliance on participatory governance, and a judicious and advised use of grant facilities and affordable loans to these countries for mainstreaming earthquake hazard reduction, can pay handsome dividends in long term urban earthquake hazard prevention, and effective and sustainable development.

[3] As two distinct periods in post-earthquake recovery cycle.

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