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Compliance to building codes for disaster resilience: Bangladesh and Nepal

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Abstract

This paper reports on a project that explores the opportunities and challenges for compliance with safe building codes for disaster resilience, focusing on two countries - Bangladesh and Nepal. Recent disasters in both countries highlight a significant problem of non-compliance with building codes. However, these disasters have brought institutional and community awareness of the importance of safe building codes, presenting a germane opportunity to explore the issues associated with compliance. Building codes do exist in the two countries, but due to socio-economic, political and cultural conditions compliance is generally lacking or limited, particularly in the large informal building sector. There is thus a need for understanding how these codes might be more widely adopted to enable disaster resilience. Collaboration between partner universities in these countries with experience in this field address: sharing the understanding that evidence-based knowledge is a critical component in the commitment to local action; improving institutional and community awareness of the importance of compliance with/barriers to enforcement of codes; fostering communities of collaborative practice; and developing local and international dissemination networks. A log-frame approach indicates the rationale, assumptions and expected outcomes of the project. The project is at a preliminary stage and this paper discusses the framework associated with the exploration of barriers and enablers to building codes compliance.

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1. Introduction

This paper reports on a project that explores the opportunities and challenges to compliance with safe building codes for disaster resilience, focusing on two countries in South Asia – Bangladesh and Nepal. The generation of scientific knowledge on building codes and construction continues apace globally, but its application to disaster risk reduction and resilience-building is lacking. South Asia is a case in point because land-use and building code frameworks are generally inadequate in low-income countries, such as the case study countries in this project. The bulk of buildings are constructed informally; rough estimates indicate that over 80% of housing in these two countries is informal [1][2]. There is very little or no application of building codes in informal sector construction. Even in the very small proportion of formal sector housing, adherence to building codes are generally lacking or limited at best. Building codes are not well-integrated into construction and planning regulations. Bangladesh and Nepal have building codes [3][4], but enforcement and compliance face significant challenges; the codes serve mainly as good practice guidelines. It is up to professionals, builders or authorities to follow them. Recognising the significance of this issue, the authors developed a research project to examine this situation, which was awarded a research grant from the Asia Pacific Network (APN) for Global Change Research. The project has recently been initiated, so this conference presents an opportunity to seek feedback on the project's research framework.

2. Knowledge relating to safe building codes

The world is continually being barraged by disasters; in the recent decade there were more than 6,300 recorded disasters, of which close to half occurred in Asia [5], a continent with a large number of developing countries where disaster impacts are the most severe. Globally, governments, international development agencies and many organisations are taking disasters and the need for resilience seriously, reflected in the approval by the United Nations member countries of the Sendai Framework for Disaster Risk Reduction (SFDRR) [6]. The SFDRR, within its wider global resilience agenda, clearly articulates the importance of safe building codes: “To encourage the revision of existing or the development of new building codes and standards” [6] is a priority in the framework. Another recent international commitment through the United Nations, the Sustainable Development Goals (SDGs) [7], has targets that recognise the importance of disaster risk reduction [8]. One of these targets is to “Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials” – and building codes would definitely be a vehicle for achieving this target. In the global ‘Resilient Cities Campaign’ of the United Nations Office of Disaster Risk Reduction (UNISDR), a key element is to “Apply and enforce realistic, risk compliant building regulations and land-use planning principles” [9]. Prominent international development agencies such as the World Bank, United States Agency for International Development (USAID) and Japan International Cooperation Agency (JICA) have begun to address this global priority for resilient buildings and are promoting the uptake, compliance and implementation of safe building codes [10][11][12].

Building codes have been defined widely, but for the sake of this research project the definition by a notable dictionary - “A collection of regulations adopted by a city to govern the construction of buildings” [13] – helps illustrate a key point. Clearly this definition, and by extension this approach to building codes, relates to developed countries where building codes and building regulations are integrated into the legislative environment whereby enforcement provisions mandate compliance (see for example, the Australian National Construction Code in [19]). The broader term ‘building regulations’ as in developed countries includes both land-use planning and building codes [14]. This integration enables minimising the impacts of disasters, as evident from Japan, which has “... some of the world’s most stringent building codes” [15], but it is also pointed out that that it took more than seven decades, and a series of disasters, for Japan to arrive at this stage [16]. However, this is obviously not the case in many developing countries where building codes are often not mandatory (see for example, [17]); for example, in an earlier version of the Bangladesh National Building Code (BNBC), it is stated that, “... the Building Code is not an independent legislation or act, rather it is a national level approved document ...” [18]. It is widely reported that enforcement and compliance of building codes face serious barriers related to governance and resource constraints, among other such factors [17][19][20][21][22][23], resulting in vulnerability to disasters.

A key issue is that many of the building codes in developing countries have been adapted from developed countries [12], but having significantly lower resources and weaker governance, the codes prove difficult to implement in the

socio-economic conditions of the developing world. A large part of the population lives in informal settlements and rural areas, and the high building standards specified in the codes are simply not feasible [16][19]. Building codes specify a wide range of design and construction guidelines and standards related to safety, health, amenity and sustainability (see for example, [24]), where the safety aspects are the most crucial to protecting human lives and well-being from disasters. Indeed, the earliest versions of building codes were mainly concerned with this aspect and they were gradually expanded to include a wider set of issues [25][26]. Therefore, in the developing world context where lack of resources and other factors are barriers to implementing a comprehensive array of building codes, to begin with this most critical life-saving element makes sense, termed here as ‘safe building codes’ to signify building standards that specifically address disaster resilience. This term is not indicated widely in the literature, but there is a recent “Safe Building Code Incentive Act” in the USA through which the government allocates extra funding for enforcing building codes in a disaster affected or prone context [27]. The term has been adopted here to reflect the specific approach of this project to prioritise disaster resilience in buildings to avoid or minimise loss of human lives and assets. In line with the concept of “grey literature” as a non-commercial publication [28], a ‘grey’ handbook contextualised for Bangladesh and Nepal will comprise one of the main outputs of the project, where a suite of safe building options will be presented to match different socio-economic, demographic and geographical conditions. The lead author produced a similar document in the past to guide housing in flood-prone areas of Bangladesh [29], and the handbook in this project will build on such initiatives for a wider range of hazards and environments.

It is widely cited that disasters present an opportunity for building future resilience [17][30][31][32]. Many country-specific guidelines and initiatives for safer buildings have arisen after major disasters (for example [33][34]). In the project countries, Bangladesh and Nepal, recent massive disasters have been triggers for institutional reconsideration of the importance of building code compliance. In Bangladesh after recent building collapses, particularly the collapse of the Rana Plaza garment factory in 2013 killing and injuring many people [35], the Bangladesh National Building Code (BNBC) has been reviewed and updated, and there are moves to make it mandatory and enforced through a new regulatory authority [36]. However, the problem persists that a large bulk of buildings are built informally without permits, hence codes are difficult to enforce within the current context.

Similarly, in Nepal after the huge number of deaths and injuries in the 2015 earthquakes and destruction of more than 250,000 buildings [37], building codes have gained significant institutional attention. The National Building Code (NBC) has been revised and it is being publicised by the government that strict measures will be applied to implement it [38]. The NBC was originally developed after a great earthquake in 1988 [39], but was followed in only very few municipalities [38]; whether it will now be more widely adopted is yet to be seen. Nonetheless, there is greater international attention and local commitment evinced at this time, perhaps the early beginning of wider acceptance and compliance, which could be supported by awareness and education.

It is therefore a relevant time for research on this topic. This project thus explores ways of achieving wider implementation of safe building codes, not only in the formal sector through regulatory enforcement, but also in the wider informal building activity through voluntary compliance. Compliance is not only about development and enforcement of regulations, but a social transformation where organisations and communities appreciate the benefits of safe codes and follow them willingly (e.g. [40]), aptly termed by Johnson [19] as a “compliance culture”. Various approaches are suggested to catalyse such a paradigm shift, such as incentives, tax benefits, reduced insurance premiums and reverse mortgage [17], inclusion in educational curricula and school buildings [19], contextualised approach according to country [41], sector-wide training including construction workers and informal builders [42], and perhaps most importantly, raising awareness [24]. This project examines such approaches in the context of the emerging initiatives on implementation of building codes to identify prospects for wider promotion and application for disaster resilient building practices.

3. Context of the case studies

It is understandable that developing countries such as Bangladesh and Nepal face constraints in implementing building codes. Beyond the oft-cited issues of enforcement and corruption, affordability is a key constraint for the vast bulk of the population that build informally. The codes provide a broad spectrum of good practice guidelines, often based on developed country models, and can thus be onerous and difficult to implement in their entirety in the socio-economic context of South Asia. However, the codes also include guidelines for safety to enable buildings to be

disaster resilient – these hazard-related codes can be termed as ‘safe building codes’ to differentiate them from codes that deal with other aspects (see for example [27]). At a bare minimum, if only the safe building codes are followed, a level of disaster resilience can be achieved.

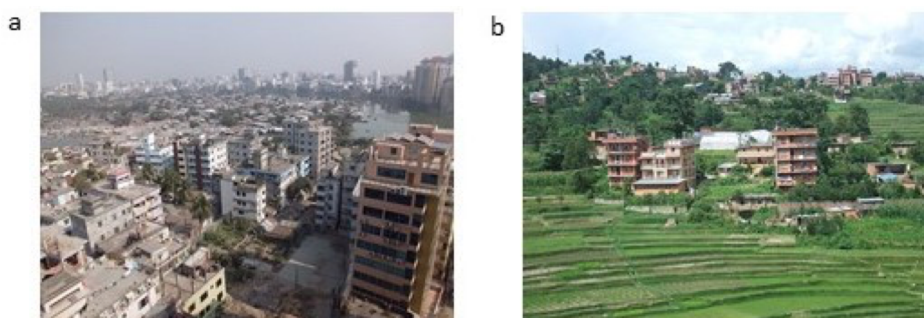


Fig. 1. Lack of compliance to safe building codes makes the rapidly growing cities in Bangladesh (a) and Nepal (b) vulnerable to disasters.

Both the project countries face disaster risk from various types of hazards including earthquakes, floods, windstorms and landslides. Nepal endured severe earthquakes recently in 2015, where the common adage “Earthquakes don’t kill people, buildings do” [43] was visibly and tragically apparent. Although Bangladesh has not experienced a major earthquake in recent times, strong tremors are frequently felt, creating public fear [44]; a massive earthquake is a real and significant possibility. Bangladesh is also frequently affected by floods and cyclones, most recently in 2016 by Cyclone Roanu [45]. Both these countries are also severely threatened by climate change with increasing magnitude and frequency of disasters. New types of hazards such as extreme heat and cloudbursts [46][47] are likely to exacerbate the impact of disasters. The avoidance of building regulations and the lack of adherence to building codes mean that it does not always require a natural hazard to result in a disaster – the collapse of the Rana Plaza garment factory in Bangladesh in 2013, killing more than 1,100 mainly women garment workers and injuring another 2,500, illustrates this point [35].

The devastating, and high-profile, disasters mentioned above including the Nepal earthquakes and Bangladesh building collapse have raised local awareness on the importance of safe buildings. They have spurred significant institutional and community interest and activity in both these countries on disaster resilient construction and safe building codes, in the face of public fear and anxiety, reported in personal communications with people there. It does appear that there might be an opportunity for voluntary compliance to safe building codes beyond the necessity of policing and institutional enforcement. It is reported that some municipalities in Nepal and some real estate developers in Bangladesh are voluntarily following building codes [48][49], representing a gradual paradigm shift. It is therefore a relevant and opportune time to undertake this project with the purpose of exploring the research problem relating to understanding the opportunities and challenges of facilitating compliance to safe building codes.

4. Relevance to policy processes

Disaster resilience is of high-level policy concern in both Bangladesh and Nepal because of the frequent and various disasters that affect these countries. Bangladesh is one of the few countries in the world that has a Ministry of Disaster Management and Relief dedicated to disaster risk reduction and has a key policy instrument in this regard, the ‘National Plan for Disaster Management’ (2016-2020) [50]. Nepal has a Disaster Management Section in the Ministry of Home Affairs and has established key policy instruments recently including the National Strategic Action Plan for Disaster Risk Reduction (2017 – 2030) and the National Disaster Risk Reduction Policy 2017 [51].

The NSDRM specifically highlights the importance of building codes for disaster risk reduction. However, in Bangladesh the issue of building codes is dealt with by RAJUK (Capital Development Authority) under the Ministry of Housing and Public Works, and although there are recent concerns there regarding building codes for disaster resilience, it is not coordinated with the national disaster management policy. There is thus the possibility of facilitating coordination between policies for disaster risk reduction and safe building practice, which this project will be able to facilitate. In terms of safe building codes, both governments require significant and extensive inputs in

translating their policy instruments on the ground particularly to address the widespread informal sector and addressing potential disaster impacts and resilience strategies for at-risk communities. Thus, the timing and scope of this project is relevant to both country contexts as policymakers and national institutions are faced with the challenges of implementing, mainstreaming and rolling out nationwide policies. It is also opportune because of recent commitments made by both countries to the global SFDRR.

5. Research Framework

The research problem is complex, multi-faceted and deeply entrenched in socio-economic, political and cultural conditions and has grown over a long period of time. Addressing it would require social transformation of a profound nature, and currently perhaps only the small beginnings of such transformation are evident. Thus, this project is a form of ‘process research’. The research question and sub-questions below are therefore not expected to provide quick-fix and easy solutions, but to identify a probable and plausible trajectory for the small beginnings of social transformation that may realise a greater and more widespread voluntary compliance of safe building codes over the long term.

5.1. The avenue of inquiry

Given the widespread lack of compliance to building codes in the case study countries of Bangladesh and Nepal and consequent disaster impacts leading to a growth of interest in safe building codes, a key research question arises, which is exploratory in nature:

How can compliance to voluntary safe building codes be facilitated in the current contexts of Bangladesh and Nepal for increased disaster resilience?

The following sub-questions are framed to deliver an answer to the main research question:

- What are the strengths and weaknesses in terms of disaster resilience of building codes globally, and specifically in the project countries?
- What knowledge and insights can be gained from institutional and community stakeholders in the project countries on opportunities and challenges for facilitating compliance to safe building codes?
- What practice-and-policy guidelines are required to facilitate voluntary compliance and implementation of safe building codes?

5.2. Exploratory methodological approach

The project methodology is linked to the main research question and sub-questions discussed. The main research question – “How can compliance to voluntary safe building codes be facilitated in the current contexts of Nepal and Bangladesh for increased disaster resilience?” – is exploratory in nature in line with definitions of exploratory research, for example, “... an examination into a subject in an attempt to gain further insight” [52] and “... the researcher’s tool to understand an issue more thoroughly” [53]. However, to seek answers to the question, a set of sub-questions are posed, that are descriptive and will allow discovery of the nature and characteristics of the phenomenon explored by the main research question. The descriptive studies will be of mixed-method, that is, they will employ a range of empirical methods including case studies, interviews, focus group discussions and workshops, utilising participatory and consultative data collection tools. Stakeholder consultations in the project countries and project workshops will be the prime vehicles for employing these methods and tools. The empirical part of the project will be substantial, informed by and positioned within global and local knowledge streams. An exploratory global literature review will cast a wide net to capture inter- and transdisciplinary perspectives.

5.3. Logical anticipation of outcomes

A ‘log frame’ (abbreviated from logical framework) was used to plan this project; this enabled providing an overview of the project’s goals, activities and anticipated results in a matrix. This matrix structure specified the components of the project and the measures by which the anticipated results will be monitored. One of the key aspects of the matrix was to elicit the assumptions made in delivering each goal or activity.

The log frame was aligned to the below five objectives of the project:

- i. A review of global literature and local literature in the project countries including building codes and regulations to identify potentials and gaps in terms of disaster resilience;
- ii. Develop an understanding of challenges and opportunities for facilitating voluntary compliance to safe building codes;
- iii. Produce practice-and-policy guidelines for facilitating voluntary compliance and implementation of safe building codes extending to informal sector buildings;
- iv. Involve early career researchers in the project countries to meet the above objectives and thereby build local research capacity;
- v. Explore possibilities of forming networks and cross-learning between the project countries and wider regional and international knowledge dissemination.

Table 1. Log frame for objective 2.

| Rationale/Action(s) | Indicator(s) | Verification | Assumption(s) |
|---|--|---|---|
| Results (Objective 2) | | | |
| Develop an understanding of challenges and opportunities for facilitating voluntary compliance to safe building codes; | A minimum of 20 participants will involve in data collections consultations in Nepal and Bangladesh Ensure at least 3 stakeholder groups are involved (NGO's, Government and building owners) | UoN will have regular meetings (Skype) with BRAC University- Bangladesh and Tribhuvan University, Nepal to work through the data collection process | The stakeholders are willing to participate and they have adequate understanding of the issues and working around building codes. |
| Result: A detailed account of the challenges and opportunities in facilitating voluntary compliance of safe building codes in Bangladesh and Nepal | Identify at least 5 key opportunities and 5 key challenges in facilitating voluntary compliance to safe building codes in project countries | The stakeholders will be given the findings to verify the outcomes. | Stakeholders will be interested in engaging with verification. |
| Outputs | - | - | - |
| Output: A report on the challenges and opportunities for facilitating voluntary safe building codes | Two 30 pages reports on opportunities and challenges each for Bangladesh and Nepal. Report will identify stakeholders who are best to address the challenges and opportunities | Submission of the reports to relevant authorities/stakeholders | The relevant stakeholders who were part of the workshops will support addressing the issues and exploiting the opportunities. |
| Activities/Process | | | |
| Activity 1 Organizing consultation workshops | At least three consultation events and 10 interviews will be organized with different stakeholders | UoN will monitor the data collection | Stakeholders are keen to participate and share their experiences |
| Activity 2 Analyzing data collected through consultations/interviews and producing a report | <u>Nvivo</u> will be used to analysis the data with identifying appropriate codes | The product of data analysis will lead to a code book and subsequent abstractions will identify at least 5 opportunities and challenges | The literature has specific information about the key issues to identify gaps and perform a systematic literature review. |
| Activity 3 Disseminate the research findings to build a case for a policy-practice guide | Organize two workshops with at least 10 members from the key stakeholder groups | Attendance numbers to the workshop | Able to attract relevant people to attend workshops |
| Means/Input | - | - | - |
| Activity 1 | Data collection assistants in Bangladesh and Nepal Venues for consultation, catering, audio recorders | Compliance to project budget Performance targets for project assistance in terms of searching material | The participants can be recruited with reasonable effort. Can find appropriate venues for consultations |
| Activity 2 | Project team members and project /data collection assistances <u>Nvivo</u> software | 1. Number of reference in the endnote (Minimum 200) 2. Analysis sheets | The consultation will lead to in-depth discussions on issues relating to voluntary code adoption |
| Activity 3 | Four project team members, projectors, catering and venue for the workshops | | There will be no unforeseen circumstances impacting on the workshop |

For example, as shown in Table 1, objective 2 will deliver a detailed account of the challenges and opportunities in facilitating voluntary compliance of safe building codes in Bangladesh and Nepal. The indicators to assess its results will be identification of at least 5 key opportunities and 5 key challenges in facilitating voluntary compliance to safe building codes in project countries. The verification will be through the stakeholder feedback and endorsement. The key assumptions include that the stakeholders are willing to participate and they have adequate understanding of the issues and working around building codes. The log frame further goes to identify the outputs and three activities supporting the outputs, each of them with specific verification indicators and assumptions. Such a log frame approach

was applied to all the above five objectives to formulate a detailed operational methodology.

5.4. Capacity development for the long term

Capacity development is an important element in this project in a number of ways. Firstly, it aims to produce guidelines informed by safe building codes that will be applicable for training of local construction workers and informal sector builders, and more broadly of personnel of government agencies and NGOs involved in the disaster resilience field. Secondly, early career researchers will be engaged in all three project countries - Australia, Bangladesh and Nepal - providing a valuable capacity building opportunity through working on this regional and also international research project. And thirdly, the involvement of CIFAL Newcastle, which itself has a strong capacity development agenda, will mean that the project outcomes will be utilised for wider training and exchange of learning. CIFAL Newcastle is engaged in other capacity building initiatives in several countries in the Asia-Pacific region, therefore the findings of this project will support regional capacity building beyond the project countries. Additionally, the World Bank will support a regional workshop to disseminate the project results, which will also promote and contribute to regional capacity strengthening initiatives.

6. Conclusion

This project is situated at a complex crossroads, where nations aspire for building codes of international quality yet contain a predominance of informal settlements. Such settlements also continue to proliferate. Genuine resilience will require these countries to develop an augmented building regulation capacity (both in terms of codes/advisory documents, and implementation/compliance), and an acceptance that this will require an extended period of execution. Informal settlements will require special sensitivity in terms of political, social and economic factors, where affordability to comply with building codes plays a vital role so that efforts do not further disadvantage the most vulnerable.

Consideration will be required as to the balance between regulatory advice, policing and enforcing compliance where appropriate, and providing well-informed good practice advice for those constructing with vernacular materials and skills, where enforcing compliance could be counter-productive. Ultimately this project is intended to inform the development of such materials, and protocols for their dissemination, which would ultimately be likely to utilise the "training of trainers" model. Such an approach has great potential as the most appropriate method of increasing capacity, across diverse topics and sectors, in low-income communities.

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References

- [1] UN-Habitat, Nepal: Urban Housing Sector Profile, UN-Habitat, Nairobi, 2010.
- [2] World Bank, Dhaka: Improving Living Conditions for the Urban Poor, World Bank Office, Dhaka, 2007.
- [3] DUDBC, Nepal National Building Codes, DUDBC (Department of Urban Development and Building Construction), Kathmandu, 2005.
- [4] HBRI, Bangladesh National Building Code, HBRI (Housing and Building Research Institute), Dhaka, 2015.
- [5] IFRC, World Disasters Report 2015, IFRC (International Federation of Red Cross and Red Crescent Societies), Geneva, 2015.
- [6] UNISDR, Sendai Framework for Disaster Risk Reduction 2015-2030, UNISDR (United Nations Office for Disaster Risk Reduction), Geneva, 2015.
- [7] UN (United Nations) (2015). Sustainable Development Goals. <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals> (accessed 20.10.16).
- [8] UNISDR, Disaster Risk Reduction and Resilience in the 2030 Agenda for Sustainable Development, UNISDR (United Nations Office for Disaster Risk Reduction), Geneva, 2015.
- [9] UNISDR, Making Cities Resilient: My City is Getting Ready, UNISDR (United Nations Office for Disaster Risk Reduction), Geneva, 2010.
- [10] JICA, Disaster Prevention of Buildings (Against Earthquake, Tsunami, Typhoon, Fire, etc), JICA (Japan International Cooperation Agency), Tokyo, 2016.
- [11] USAID, Building Code Implementation Program in Municipalities of Nepal, USAID (United States Agency for International Development), Kathmandu, 2016.
- [12] World Bank, Building Regulation for Resilience: Managing Risks for Safer Cities, Global Facility for Disaster Risk Reduction (GFDRR), Washington DC, 2015.
- [13] Merriam-Webster, Definition of building code. <http://www.merriam-webster.com/dictionary/building%20code>, n.d. (accessed 21.10.16).

- [14] ABCB (Australian Building Codes Board) What is the National Construction Code (NCC)? <http://www.abcb.gov.au/NCC/About>, 2015 (accessed 17.10.16).
- [15] J. Glanz, N. Onishi, Japan's strict building codes saved lives, *New York Times*, 11 March 2011.
- [16] J. Gale, Nepal building code author says disaster was waiting to happen. <http://www.bloomberg.com/news/articles/2015-04-28/nepal-building-code-author-says-disaster-was-waiting-to-happen>, 2015 (accessed 21.10.16).
- [17] V. Thirupugazh, Urban vulnerability reduction: regulations and beyond, in: R. Jha, (Ed.) *The Indian Economy Sixty Years after Independence*. Palgrave Macmillan, UK, 2008.
- [18] HBRI and BSTI, Bangladesh National Building Code 2006, HBRI (Housing and Building Research Institute) and BSTI (Bangladesh Standards Testing Institute), Dhaka, 2006.
- [19] C. Johnson, Creating an enabling environment for reducing disaster risk, in: UNISDR (Ed.) *Global Assessment Report on Disaster Risk Reduction*, UNISDR (United Nations Office for Disaster Risk Reduction), Geneva, 2011.
- [20] K. Koroluk, Construction corner: Developing countries need strong building codes, *Daily Commercial News*, 10 June 2016.
- [21] T. Moullier, Improving Building Code Implementation and Compliance for more Resilient Buildings in Developing Countries: Considerations for Policymakers. Global Facility for Disaster Risk Reduction, Washington DC, 2014.
- [22] A. Surjan, R. Shaw, Building codes and land use planning: Challenges of development and enforcement, in: R. Shaw, R. Krishnamurthy (Eds.) *Disaster Management: Global Challenges and Local Solutions*, CRC Press/Taylor & Francis Group, Boca Raton, Florida, 2009.
- [23] UNEP, *Handbook of Sustainable Building Policies*, UNEP (United Nations Environment Programme), Nairobi, 2013.
- [24] F.D.K. Ching, S.R. Winkel, *Building Codes Illustrated: A Guide to Understanding the 2015 International Building Code*, John Wiley & Sons, USA, 2016.
- [25] WBDG (Whole Building Design Guide), *Codes and Standards Development*, National Institute of Building Sciences, Washington DC, 2015.
- [26] UNESCAP, AIT, *Integrating Environmental Sustainability and Disaster Resilience in Building Codes*, UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) and AIT (Asian Institute of Technology), Bangkok, 2012.
- [27] Library of Congress, H.R.1748 – safe building code incentive act. <https://www.congress.gov/bill/114th-congress/house-bill/1748>, 2015 (accessed 21.10.16).
- [28] A. Lawrence, Electronic documents in a print world: Grey literature and the internet, *Media international Australia*. 143 (2012), 122-131.
- [29] I. Ahmed, *Handbook on Design and Construction of Housing in Flood-Prone Rural Areas of Bangladesh*, Asian Disaster Preparedness Center, Bangkok, 2005.
- [30] J. Birkmann, P. Buckle, J. Jaeger, M. Pelling, N. Setiadi, M. Garschagen, N. Fernando, J. Kropp. Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters, *Natural Hazards*. 55(3) (2010) 637–655.
- [31] R. Haigh, D. Amaratunga, A window of opportunity, *International Journal of Disaster Resilience in the Built Environment*. 2(2) (2011) 100-102.
- [32] S.B. Manyena, Disaster event: Window of opportunity to implement global disaster policies? *Jamba: Journal of disaster risk studies*. 5(1) (2013)
- [33] ERRA, *Guidelines for Earthquake Resistant Construction of Non-Engineered Rural and Suburban Masonry Houses in Cement Sand Mortar in Earthquake Affected Areas*, ERRA (Earthquake Reconstruction & Rehabilitation Authority), Pakistan, 2006.
- [34] NHDA (National Housing Development Authority) *Guidelines for Housing Development in Coastal Sri Lanka*, Ministry of Housing, Colombo, 2005.
- [35] IGHRL (Institute for Global Labour and Human Rights) *Rana Plaza: A look back and forward*. <http://www.globallabourrights.org/campaigns/factory-collapse-in-bangladesh>, 2014 (accessed 20.10.16).
- [36] HBRI, Bangladesh National Building Code, HBRI (Housing and Building Research Institute), Dhaka, 2015.
- [37] *The Hindu* Over 2,50,000 buildings damaged in Nepal quake. <http://www.thehindu.com/news/international/over-250000-buildings-damaged-in-nepal-quake/article7161808.ece>, 2015 (accessed 21.10.16).
- [38] Property News, Govt issues construction guidelines: Building bye-laws model guideline 2015 Nepal. <http://www.housingnepal.com/news/national/govt-issues-construction-guidelinesbuilding-by-laws-model-guideline-2015-nepal>, 2015 (accessed 21.10.16).
- [39] EERI (Earthquake Engineering Research Institute), *Nepal National Building Code (NBC): An Overview*. <http://www.ecclearinghouse.org/2015-04-25-nepal/2015/05/05/nepal-national-building-code-nbc-an-overview/>, 2015 (accessed 20.10.16).
- [40] H. Elffers, P. Verboon, W. Huisman (Eds.), *Managing and Maintaining Compliance*, Boom Legal Publishers, The Hague, 2006.
- [41] D. Bergeron, Codes for existing buildings: Different approaches for different countries, 7th International Conference on performance-based codes and fire safety design methods, Auckland, New Zealand, 2008.
- [42] Build Change, Nepal. <http://www.buildchange.org/locations/nepal/>, 2015 (accessed 21.10.16).
- [43] N. Stockton, Earthquakes don't kill people, buildings do. <https://www.wired.com/2015/04/earthquakes-dont-kill-people-buildings/>, 2015 (accessed 21.10.16).
- [44] Daily Star, Bangladesh wakes up to tremors. <http://www.thedailystar.net/country/bangladesh-wakes-tremors-196783>, 2016 (accessed 20.10.16).
- [45] ABC News, Cyclone Roanu leaves thousands of Bangladeshis homeless, death toll rises. <http://www.abc.net.au/news/2016-05-22/thousands-homeless-in-cyclone-hit-bangladesh/74358622016>, 2016 (accessed 21.10.16).
- [46] Bangladesh News, “‘Cloud Burst’ Breaks 53-Year Record”, *Bangladesh News*, Dhaka, 29 July 2009.
- [47] A.N.M.M. Khan, *Impact of Climate Change on the Livelihood of the Urban Poor: A Case Study of Dhaka City* (thesis), North South University, Dhaka, 2010.
- [48] Metro Homes, Metro Homes Development Ltd: Find your future today. <http://www.metrohomesbd.com/>, n.d. (accessed 20.10.16).
- [49] J.K. Subedi, N. Mishima, (Eds.), *Handbook - Building Code Implementation: Learning from Experience of Lalitpur Sub-Metropolitan City, Nepal*, LSMC (Lalitpur Sub-Metropolitan City), Lalitpur and UNCRD (United Nations Centre for Regional Development), Hyogo, 2008.
- [50] MoDMR (Ministry of Disaster Management and Relief), *National Plan for Disaster Management (NPDM 2016-2020)*, Government of Bangladesh, Dhaka, 2016.
- [51] MoHA (Ministry of Home Affairs), *National Strategic Action Plan for Disaster Risk Reduction 2017 – 2030; National Disaster Risk Reduction Policy 2017*, MoHA, Kathmandu, 2008.
- [52] Study.com, Exploratory research: Definitions, methods & examples. <http://study.com/academy/lesson/exploratory-research-definition-methods-examples.html>, 2016 (accessed 21.10.16).
- [53] Fluid University, Exploratory research: What is it? And 4 ways to implement it in your research. <http://fluidsurveys.com/university/exploratory-research-4-ways-implement-research/>, 2014 (accessed 21.10.16).