INTEGRATING DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION INTO THE BUILT ENVIRONMENT

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ABSTRACT

Recent disasters across the world have highlighted the fragility of the built environment to a range of natural hazards, including those that may be influenced by climate change. Moreover the rapid pace of urbanisation has increased concerns about the resilience of cities; with contemporary discussions considering how physical/protective interventions can be integrated into the built environment or, indeed, what types of interventions are most effective. Too often Disaster Risk Reduction (DRR) and Climate Change Adaption (CCA) have been treated as separate issues. Despite a shift to more pro-active and pre-emptive approaches to managing disaster risk, DRR appears to have been overly influenced by more reactive emergency management practices. At the same time, CCA activities have typically fallen within the realm of environmental sciences. As a result there appears to be critical disconnects between policies for CCA and DRR; often centered in different departments with little or no coordination. Moreover, there is a lack of integration of these policies within building regulations; the scope of which is largely limited to rigid restrictions in height and volume and specifications of materials and technology. Most often these building regulations are focused on the mitigation of a single hazard such as earthquakes, floods or cyclones.

This opinion paper will highlight the lack of integration between DRR and CCA in built environment related policies and regulations, and demonstrate how policy and regulations can be used to make DRR including CCA inputs from key built environment stakeholders more proactive and thus more effective.

Key words: *disaster risk reduction; climate change adaptation; built environment; policy*

INTRODUCTION

As pointed out by Wisner et al. (2012, p.31), the “natural environment is neither a hazard nor resource until human action makes it one or the other (or both)”. Vulnerability is thus created not by the environment but by poor decision-making, practices (including construction practices) and planning. Natural hazards only become disastrous if a settlement (or any kind of a built environment) is located in a hazard-prone area, poorly constructed and/or does not have a warning system in place.

The built environment is one of the largest contributors to greenhouse gas emissions worldwide (Anderson et al., 2015) and at the same time it can be extremely vulnerable to the effects of climate change. This emphasises the increasing importance of the role of the built environment in reducing its negative contributions to climate change by making the building stock more energy efficient, and in adapting to the negative impacts of climate change by increasing resilience through investment in DRR measures (Lizarralde et al., 2015). However, while the concepts of climate change and DRR are widely discussed, it is not always clear to what extent these notions are interrelated. There appear to be fundamental conflicts between perspectives dominated by eco-efficiency (minimising the use of resources) and long-term resilience (robustness of built assets) to the impacts of climate change. This however does not mean that both these perspectives cannot be addressed simultaneously. It is becoming clear that DRR and CCA must go hand in hand - particularly when it comes to the planning, design, construction and operation of the built environment, with the references to both areas increasingly appearing in international guidance and reports.

Based on the extensive review of literature, this opinion paper will discuss the above mentioned issues by highlighting the lack of integration between DRR and CCA in built environment related policies and regulations in the UK, India, USA and Barbardos. It will highlight how policy and regulations can be used to make DRR including CCA inputs from key built environment stakeholders more proactive and thus more effective.

CCA, DRR AND THE BUILT ENVIRONMENT

An increasing number of international and national policy documents acknowledge climate change as a ‘risk multiplier’ (e.g. UK National Security Strategy), although it can also diminish risks, and as a result a large number of climate change mitigation strategies aimed at reducing greenhouse gas emissions (mainly by reducing fossil fuel consumption and introducing new renewable energy technologies) have been introduced in recent decades. Being a global challenge (and which can only be addressed globally), climate change has become a distraction from other equally important concerns, or ‘creeping environmental problems’ (Glantz 1994), such as resource overexploitation or inequality.

Therefore whilst it is not appropriate to ignore climate change, it is important to bear in mind other hazards. CCA efforts should be seen as a part of the DRR agenda, with climate change being treated as one of the hazards (Kelman, 2015), although it is equally important not to overlook climate change mitigation.

The impacts of climate change on disaster risks are not only relevant to the increase in frequency and severity of a hazard, but also to encompassing vulnerabilities, as climate change rapidly affects local environments changing them in a way that local knowledge becomes less applicable (Kelman, 2015). Taking into consideration the possible effects of hazards and threats related to climate change and disasters that may affect the built environment presents a great challenge to both policy-makers and built environment professionals. They have to make a choice of either taking as a basis the upper limits of uncertainties provided by the projection scenarios, or continue with current practices therefore potentially reducing the lifetime of a structure. Whilst the former is a more effective adaptation strategy, it may be less cost-effective.

A large number of cities have introduced and applied numerous mitigation measures aimed at greenhouse gas emissions and energy consumption reduction, however only a few cities have been creative and productive in the realm of adaptation (Jabareen, 2015). This suggests that built environment professionals and policy-makers do not act enough to mitigate uncertainties from climate change and other natural hazards and human-induced threats. Instead of developing strategies for coping with risks, the vulnerabilities are often increased by decisions that do not take local context into account or are not appropriately enforced (Bosher, 2014).

Regulations and policies that address how the built environment is designed, planned and operated are critical for DRR including CCA, as the ways in which land is used and buildings and infrastructure are designed and operated influence exposure to hazards and threats. Once the investment in built assets in a risk-prone location has been made, it will remain there for a long period of time; in addition, once in place it is more expensive and less effective to correct and add new DRR measures than it would have been to avoid the creation of the risk in the first place (UNISDR, 2011). It is therefore clear that building regulations and planning policies can be a primary prevention, mitigation and adaptation mechanism.

During the past 25 years, building regulations and codes have been developed for virtually every type of construction; there are also an increasing number of informal guidance documents for the construction sector. They are constantly revised and improved, and the evidence shows that in those countries where building codes have been effectively applied, there is a dramatic improvement in performance of new construction (Krimgold, 2011). The majority of the current building codes and regulations and land-use planning policies take into account various hazards and threats (e.g. floods and storms, earthquakes). However whilst these policies and regulations have shifted towards addressing the root causes of vulnerabilities to disasters such as structural integrity of a building, they do not often do so explicitly and tend to focus only on a single hazard or one part of the problem. In addition, mandatory built environment policies are based on the historical trends and previous events thus neglecting future projections that are critical for effectively embedding CCA within DRR.

CHALLENGES AND OPPORTUNITIES FOR INCLUDING CCA IN DRR

DRR and climate change are addressed in separate policy arenas at international and national levels. However starting with Hyogo Framework for Action 2005-2015 and 2007 Bali Action plan, a number of efforts have been made to point out the importance of addressing DRR and CCA together (UNISDR, 2008). This has also been reemphasised in the Sendai Framework for DRR, and further strengthened during the COP21 meeting in Paris in 2015. For instance, the building code reviews, which usually reflect the most recent impact of a disaster event (be that natural hazard (e.g. an earthquake) or a human-induced threat (e.g. terrorism)), will now likely be made based also on future projections of change in wind speeds or height of storm surges, as well as other climate impacts.

However, despite recent debates for integrating CCA into DRR, there is hardly any evidence about technical and institutional challenges in practice (Davies et al. 2013). Around the world, solid frameworks for CCA and DRR exist, however these frameworks are not easily included into the built environment-related regulations and policies. There is a disconnection in the way that DRR and CCA are treated: for instance both CCA and DRR are often preparedness and response oriented, thus paying less attention to prevention considerations into a country's development and planning practices, and consequently not sufficiently mainstreaming DRR and CCA into policy-making.

Whilst the issues addressed under CCA and DRR policies relate to the built environment, the interventions are often planned and implemented by different ministries. Neither DRR nor CCA are a sector, as they require informed action across a number of sectors (from education to health to utilities). DRR is often handled by civil defence and emergency management departments, which do not have links with environmental or economic ministries that overlook national planning and climate-change related policies. In addition, DRR and CCA are not the sole responsibilities of these departments and therefore tend not to be at the top of their priority lists. This creates further challenges for the built environment when building regulations, codes, and planning policies are introduced, as often the contribution of both DRR and CCA into these policies is negligible. Moreover professional training of the built environment professionals does not mainstream DRR and CCA as these competencies are not required in order to follow the existing regulations.

Building regulations and planning policies present an excellent opportunity for incorporating CCA into DRR. However there are some challenges that can diminish the role of building regulations and codes in DRR. For instance, land use planning maybe ineffective if it is implemented at a local level but a given risk crosses legislative boundaries of that locality. In addition, planning processes are often long-winded and inconsistent with the rapid development of a city (this is particularly an issue in the middle- and low-income countries). Similarly, building codes and regulations often do not take local specifics into account, and their implementation is often hindered by a lack of required expertise and manpower within the local government to monitor and enforce the regulations (UNISDR, 2011). Governments are often reactive and slow in responding to the issues related to CCA and DRR, and although new improved regulations are introduced, there is often a lack of incorporation of older buildings' and infrastructure upgrade. The lack of government initiative also drives market barriers, as often risk-averse construction professionals are reluctant to invest in new technologies and practices that could be more appropriate in terms of CCA and DRR (van Heijden, 2014). Another issue is lack of implementation of these regulations and policies. Moreover these regulations and policies are not designed to address specific design and construction technologies as prevalent in various regions; their contextualisation thus indeed being a challenge. Another important challenge is a lack of stakeholder engagement, particularly in the private sector. DRR is often seen as a responsibility of emergency managers, however multi-stakeholder participation can increase the capacity and capability of those who take part in DRR. Involvement of various public and private stakeholders can also lead to and facilitate knowledge and experience sharing. It is essential to identify those stakeholders who can have a positive influence over DRR in the built environment at various stages of the design, construction and operation processes, including commissioning, operation and maintenance, as effective decision making requires an integrated understanding of how to avoid and mitigate the effects of disasters (Chmutina et al., 2014).

Tensions created by CCA and DRR policies

Whilst complementary, CCA and DRR policies create some tensions when addressing the challenges faced by the built environment, due to differing interpretations of terminology, institutional responsibilities and contextual differences:

1. *Specific vs. broad scope*: CCA policies largely focus on what can be achieved in terms of adapting to climate change-induced threats, in

particular storms and floods. DRR policies put emphasis on the capacities that are (or should be) available in order to cope with a wider range of risks and threats, both natural and human-induced often regardless of their connection to the impacts of climate change.

2. *Efficiency vs. redundancy*: The overarching climate change agenda that informs CCA policies often endorses a lean approach to development and streamlining processes that goes hand in hand with climate change mitigation, i.e. to reduce consumption and minimise environmental impacts. DRR policies are more open to the potential benefits of over-designing (i.e. using more material resources to increase robustness) in order to avoid damages and prevent disasters.
3. *Emphasis on standards vs. emphasis on potential*: CCA policies have been informed by, and focused on, globally accepted standards often neglecting local context. DRR policies are often driven at the local level and encourage the identification and reinforcement of local potentials and capacities of the system.
4. *Reactive vs. proactive:* CCA policies acknowledge that climate change will have a negative impact on the built environment and therefore suggests the ways of adapting to these impacts. DRR policies (at least on a theoretical level) acknowledge the importance of a more pro-active approach to dealing with risks.

Main areas in which synergies could and should be created

These tensions are important to consider, however a number of areas in which synergy can (but does not necessarily do so yet) complement both CCA and DRR is in relation to the challenges faced by the built environment.

1. *Similar goals*: CCA and DRR policies implemented at the local level essentially address the same issues.
2. Synergising CCA and DRR can provide a basis for the much needed *multi-stakeholder engagement*: currently CCA is mainly addressed by environment-related departments, whereas DRR is a responsibility of emergency managers, with the private sector and communities in many cases not being involved in decision-making at any stage. Multi-stakeholder engagement can bridge disconnected policy and practice by putting those at risk (e.g. businesses and vulnerable sections of society) to the forefront.
3. *Knowledge sharing*: Multi-stakeholder engagement will allow for the integration of scientific knowledge of the environmental (and other) professionals, local knowledge of communities that is prevalent in the DRR, and practical context-specific knowledge of the built environment professionals. In addition, CCA can draw from some of tools developed within DRR (e.g. risk monitoring).

4. Overarching DRR plans can employ a *holistic approach* by emphasising natural resource protection, land-use planning and building codes that also address reduced energy consumption.
5. *Time scales*: synergies between CCA and DRR would allow for the expansion of DRR's efforts time horizon by utilising future projections developed as part of CCA. In doing this it could be easier to justify investment in pre-emptive risk reduction considerations for future developments.
6. *Budget allocation* will be more effective if it is aimed at both DRR and CCA thus helping to reduce doubling efforts and increasing institutional effectiveness.

However in order to create these synergies, some basic challenges need to be overcome. These include existing institutional gaps and lack of coordination between various departments/ministries linked to DRR and CCA. Also there is challenge of using commonly understood vocabulary for DRR and CCA. Another common issue is the nature of financial allocations that are made under separate budget heads for DRR, CCA and other related areas thereby making it difficult to pull the resources for integrated planning and implementation. Last but not the least is the challenge of integrating CCA into DRR policies and programmes at national, district and local levels.

CONCLUSIONS

As demonstrated in this paper, the contribution of the built environment to climate change and CCA is well accepted in current building policies and regulations, however the risk reduction rationale in these regulations originates mainly from the past. This sets a challenge of expanding the current existing focus of building regulations: there is a need to incorporate a wider holistic ecological approach that looks at regional impacts and vulnerabilities and is not just limited to the performance of the built environment.

CCA and DRR initiatives currently work in silos, neglecting and underestimating their commonalities and goals, or being unable to overcome political constrains. Such a lack of synergy should not be ignored as it increases the risk of unsuccessfully reducing vulnerabilities of the built environment in the long run. Whilst there is enough understanding about how to place CCA within DRR, there is a lack of appropriate governance approaches and tools. This leads to multiple negative consequences, including duplicating efforts that lead to organisational inefficiencies and ineffective use of resources as well as counter-productive efforts, in particular by reinventing older approaches (Mercer, 2010).

In order to achieve a truly sustainable and resilient built environment it is critical to achieve an effective scale of hierarchically interdependent built elements. If such hierarchy is weak, the vulnerability of a built environment increases and therefore an impact of one hazard may exacerbate the impact of another hazard, thus creating a complex/compound hazard. Vulnerability continually increases in many places because the size and complexity of the built environment is increasing, with systems and networks planned, designed, constructed and operated without appropriate attention to the potential risks. Climate change presents an additional challenge and opportunity; therefore what were previously considered reasonable margins of safety in the traditional engineering approaches may no longer be relevant or effective.

Climate change has become a part of the built environment's political agenda nationally and internationally in many countries, and it therefore could act as a mechanism to attract attention of policy makers to DRR. This however has to be done carefully in order not to shift the agenda to climate-induced hazards only, but instead it is critical to make DRR part of the sustainability agenda. Whilst it is important to build a structure that is energy efficient and constructed using materials that have minimal impacts on the environment, it is equally important to make sure that it is not in a risk-prone area and is not going to be destroyed by the next earthquake or flood. DRR including CCA should play a bigger role in building regulations and planning policies.

Structural measures can predominate in DRR – but this is also appropriate for CCA. Incorporation of CCA into DRR in the context of the built environment can be imposed through effectively implementing, monitoring, and enforcing building regulations and codes and land use planning and zoning requirements, ensuring that responsibility for preventive, protective and mitigation actions lies with engineering and planning professionals. It can also contribute towards climate change mitigation. Planning policies also present a unique opportunity to integrate policies of mitigation, adaptation, land use and other sustainability-related measures in one legally binding document. However, it is important to incorporate ecological perspectives through adaptable design, which increases flexibility and durability of the built environment. Better integration of CCA into DRR can promote more structured and coordinated planning, construction and operation mechanisms and simultaneously provide support for overall sustainable development.

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