



# University of HUDDERSFIELD

## University of Huddersfield Repository

Jayakody, R.R.J.C., Amaratunga, Dilanthi and Haigh, Richard

Planning and designing public open spaces as a strategy for disaster resilient cities: a review of literature

### Original Citation

Jayakody, R.R.J.C., Amaratunga, Dilanthi and Haigh, Richard (2016) Planning and designing public open spaces as a strategy for disaster resilient cities: a review of literature. In: Building the Future - sustainable and resilient built environments. FARU Proceedings (2016). Faculty of Architecture: University of Moratuwa, Colombo, Sri Lanka, pp. 156-168. ISBN 978-955- 9027- 56-0

This version is available at <http://eprints.hud.ac.uk/id/eprint/30636/>

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: [E.mailbox@hud.ac.uk](mailto:E.mailbox@hud.ac.uk).

<http://eprints.hud.ac.uk/>

Rajakapsha.Upendra, et al (eds), 2016, "Building the Future – resilient environments": *Proceedings of the 9<sup>th</sup> International Conference of Faculty of Architecture Research Unit (FARU), University of Moratuwa, Sri Lanka, September 09-10, Colombo* pp. 000–000. ©

## **PLANNING AND DESIGNING PUBLIC OPEN SPACES AS A STRATEGY FOR DISASTER RESILIENT CITIES: A REVIEW OF LITERATURE**

JAYAKODY. R.R.J.C<sup>1</sup>, AMARATHUNGA. D<sup>2</sup> and HAIGH. R<sup>3</sup>

<sup>1, 2, 3</sup>*University of Huddersfield, Huddersfield, United Kingdom*  
*Chathuranganee.Jayakody@hud.ac.uk.*

**Abstract.** Public open spaces are often used as a mode to make cities sustainable from all its three counts; economic, environmental and social. Most of contemporary urban planners, designers, and landscape architects use the public open spaces as a mode to increase the urban quality of life, improve aesthetic attractiveness, improve the environmental health, growth of economy, and to increase the walkability, liveability and vitality of a city which direct towards the sustainability. However, sustainable development should also encompass the enhancements of disaster resilience. Yet, the use of public open spaces as a strategy for disaster resilience, still remains largely unrehearsed when planning and designing sustainable cities. Accordingly, the aim of this paper is to emphasize the need of planning and designing public open spaces with a focus on disaster resilience; as an agent of recovery, to provide essential life support, as a primary place to rescue and for shelters and potential for adaptive response. Further, this ongoing research study analyses the current literature and presents the significance of combination of disaster management strategies with urban planning and designing strategies in order to make cities resilience to disasters. Finally, the analysis suggests a framework to plan and design public open spaces for sustainable disaster resilience cities, proposing set of concepts; loose space concept, Urban Sponge Park, Network of Open Spaces, which can be potentially used when planning and designing public open spaces for disaster resilient cities.

**Keywords.** *Disaster Resilience cities, Public Open Spaces, Sustainable Development, Urban Designing, Urban Planning*

### **1. Introduction**

Cities contain significant amount of people, infrastructure, amenities and modern facilities. Pelling (2012) describes, cities as the engines of economic growth, an integrated system linked with consumption and production, a

source of livelihood, a stock of accumulated assets, and a political and cultural arena. Hence, any adverse effect to a city means, adverse effect to significant number of people, infrastructure, amenities and modern facilities and engines of economic growth of a country.

This reflection is even more significant, in the global urban context. Global urbanization trend pattern establishes, that there is population increase and increase of human migration towards cities, most commonly for reasons such as jobs, education and new lifestyle. Therefore, urban areas will contain increasingly large proportion of world's population. Confirming this, Zhang (2015) state the percentage of urban population in 2014 is 54% and this will increase up to 72% by 2050.

This rapid population growth together with rapid urbanization, create significant challenges to both natural and built environment in cities, including more pressure on land and services resulting inadequate resource management, settlements in hazard prone areas, lack of capacities, unclear mandated for DRR at local level and decline of ecosystems and so on (UNISDR, 2012). These challenges increases the exposure of the city dwellers to natural disasters. As a result, most of the cities in the world which contain large proportion of people, are at risk from the effects of climate change and natural disasters. For instance, Huq, Kovats et al. (2007) states many cities in Africa are at risk from sea-level rise and storm surges (e.g. Banjul, Lagos and Alexandria) and many of the world largest cities in Asia are at risk of flood inundation (e.g. flood plain of major rivers the Ganges–Brahmaputra, the Mekong and the Yangtze). Therefore, it is increasingly important to plan and design these cities with a focus on 'disaster resilience'.

Further, Malalgoda, et al. (2013) state that unplanned cities and urbanisation can be one of the major challenges ahead to create a disaster resilience built environment in cities. However, León and March (2014) emphasize, urban planning and designing can play a vital role in making cities resilience through its ability to incorporate multi-dimensional aspects affecting disaster risk reduction. Adding to this, UNISDR (2012) states that strategic planning and design of spatial elements and their influence on the natural and built environment are directives of city's capacity to absorb and recover from the effect disasters. Accordingly, it can be understood that, planning and designing can play a significant role when increasing cities' resilience to disasters.

Further, to enhance the disaster resilience through planning and designing interventions, the focus can be given on different spatial elements of a city such as buildings, parks, playgrounds, streets, and infrastructure. Public open space is one of the key spatial elements which can play an important role in cities. However, the role of public open spaces to enhance the cities' resilience specially, encouraging adoptive response after a disaster, still remains

as a largely uncovered area (Hossain, 2014). Accordingly, this research paper mainly focuses on identifying potential uses of public open spaces for disaster resilience and to identify the planning and designing interventions that can be used to harness these identified potentials.

## **2. Research Method**

This paper is based on the findings of a literature analysis, conducted to evaluate the state of the art in the subject area which was carried out as part of an ongoing PhD research study. Accordingly, the literature was critically evaluated to synthesis the findings. In order to ensure that the literature review is complete and comprehensive the researcher has critically reviewed journal papers, book chapters, conference papers as well as local and international reports which discuss the issues in the subject area. At the same time, this literature review has been presented in different national and international audiences where the literature review has been critically examined and modified according to the feedback received.

## **3. What is a ‘Public Open Space’**

As this study focuses on the use of public open spaces for disaster resilience, first it is imperative to understand, what is it meant by the term ‘Public Open Space’. The term ‘Public Open space’ was used in 19th century in United Kingdom and United States, when allocating spaces for the improvement of the health and quality of life of the working class people who lived in squalid and congested urban environment (Giles-Corti, Broomhall et al., 2005). According to Swanwick, Dunnett et al. (2003), currently this term is widely used with variety of meanings, ranging from ‘green space’ (e.g. parks, greenways) to all the types of public spaces counting streets and squares and also private spaces including gardens, courtyards.

The definition of Public open spaces can be found from different standpoints. Woolley (2006) introduced two forms of definitions. One is constructed on primary purpose of allocation which derives from the policy stance. Accordingly, Public Open spaces is positioned in between green space and civic space including Parks and gardens, Natural and semi-natural green space, including urban woodland, Green corridors, Outdoor sports facilities, Amenity green space, playgrounds for children and young people, Allotments, community gardens and urban farms, Cemeteries, disused churchyards and other burial grounds.

The second definition place the Public Open spaces as a space that allows different types of activities encircling necessary, optional and social activi-

ties. This includes Parks, Playgrounds, Playing fields and sports grounds, School playgrounds, Streets, City farms, Incidental or 'natural' green spaces. This definition is more towards the users' point of view rather than the purpose of allocation. Two main important points that can be raised from these two definitions are:

1. Public open space can be any space between green space and civic space but has to be used by the public and
2. It should be an outdoor space which is not covered by buildings.

The following categorization of 'Public Space' which was introduced by Carmona (2010), opens up another dimension to this understanding. He categorises the Public space in to three groups based on the accessibility, ownership and use.

1. External Public Space – All spaces between the private landholdings including Public squares, streets, highways, parks, parking lots, stretches of coastline, forests, lakes and rivers etc.
2. Internal Public Space – Various public institutions (e.g. Libraries, museums, town hall) and Public transport facilities (e.g. Bus stations, Train stations)
3. External and internal Quasi Public Space – This means privately owned public spaces such as sports grounds, restaurants, cinemas and shopping malls. Places where legally private and nominally public.

The accessibility and the use, are two main important points for this study which can be identified in this categorization. Accordingly, there can be 'open spaces' within a city but if it is not accessible to the public, that cannot be considered as 'Public Open Space'. Therefore, the 'Public open spaces' should be accessible to public and also should be allocated for public use which was also identified by Woolley's definition.

Accordingly, it can be summarised that the working definition of 'Public Open Space' in this study, is any outdoor space which is accessible to the public and allocated for the public activities, e.g. Public squares, Parks and gardens, Amenity green spaces and coastlines. With this understanding, next section discusses the current use of Public Open Space and potential future use for disaster resilience.

#### **4. The use of Public Open Spaces for Disaster Resilience**

Most of the contemporary urban planners and designers, use the Public Open Spaces to make sustainable cities in multiple-dimensions. Public Open spaces are mostly used to improve the scenic amenity and to promote active and

passive engagement with the place, benefiting the physical and psychological wellbeing of urban dwellers. Further, these public open spaces are also used to promote social interaction and cohesion. In addition, green public open spaces offer the environmental benefits such as water and air purification, noise and wind filtering and microclimatic comfort. Furthermore, all the above values and functions of Public Open spaces directly and indirectly contribute to the economic growth of cities.

However, Vargas-Moreno, Meece et al. (2014) highlights that Public Open spaces have the potential to act proactive manner, contributing multi-scale within the entire city to solve the current and future problems and issues. At the same time, as discussed before, the need to enhance the cities' resilience to disasters, is an increasingly important and one of the key proactive approaches for sustainable cities. However, the current planning and designing lens has not been fully utilized to look at the use of public open spaces for disaster resilience.

Confirming this, Hossain (2014) state that the role of public open spaces in increasing cities' resilience to disasters, has not been fully discovered yet. Consequently, this paper attempts to analyse the current literature which discusses the potential uses of Public Open space as a strategy for disaster resilience cities and establishes the research gap, through the discussion on current problems and issues of harnessing these potentials. Accordingly, the literature analysis reveals that the public open spaces in a city have the potential to contribute three main stages in disaster management; emergency evacuation, recovery and mitigation.

#### 4.1 EMERGENCY RESPONSE AND RECOVERY

The potential use of Public Open Spaces for emergency response and recovery, is mostly discussed in the literature related to earthquakes and Tsunami events. With a major contribution, Allan and Bryant (2010), analyse critical role of public open spaces in an earthquake event: case study in San Francisco, Northern California. This study reveals that, after the earthquake, parks and playgrounds in the city were mainly used as safer places to gather, shelters, to build low cost cabins and sometimes the sloping land of some parks became inconvenient to build the camps. Moreover, this analysis discloses that after a major earthquake, city's open spaces become the 'second city' providing simple to multifaceted services such as gathering, sheltering, distribution of goods and service, temporary inhabitation and commemoration. Accordingly, it can be identified, the importance of having different typologies of open spaces (small squares to parks) contributing different functions

of emergency management and recovery and also the importance of consideration on connectivity among those Spaces with a potential to act as a 'second city'.

Conversely, Fuentes and Tastes (2015) emphasize the significance of connectivity between the public open spaces in a city, through the consideration on linkage between open space, resilience and urban design as an integral way to plan and design resilient cities. Further, their research on earthquake and tsunami in Chile 2010; Case study on San Pedro de La Paz, recommend the need of designing open space network contributing to urban resilience. Further, this study recommends to take account of open spaces as an urban asset for seismic events under the resilience framework.

Adding to this argument, León and March (2014) demonstrate that, along with the connectivity, the consideration need to be given on three other factors, when using public open space as a tool for 'rapid resilience'. This study was undertaken with a special focus on tsunami prone coastal urban communities and the findings reveal that Open spaces and streets need to be planned and designed with a focus on Tsunami evacuation providing safe assembly spaces, basic emergency services and utilities, such as first aids, fresh water, electricity, and communication. Further, they emphasize that, along with the accessibility and connectivity, public open spaces need to be planned and designed with adequate location, capacity and terrain qualities for Tsunami prone coastal urban communities. Accordingly, it can be understood that these factors such as accessibility, connectivity and terrain qualities, may vary according to the type of the disaster, yet there is a significant potential of using public open spaces for emergency evacuation and recovery after a disaster. Furthermore, it is imperative to harness this potential when increasing cities' resilience to disasters.

#### 4.2 DISASTER MITIGATION

Apart from emergency management and recovery, the literature analysis explores the potential use of public open spaces to mitigate the impacts of natural hazards. Currently, this usage has been identified mostly in flood risk mitigation strategies and has included to flood risk management frameworks. Confirming this, Burby and French (1981) and White and Richards (2007) state that flood prone areas need to be protected from future development and the most common way to do this, is to keep the flood-prone areas for open space purposes.

However, most of these discussions merely recommend to preserve the hazard prone lands as open spaces and lack of consideration is given to un-

derstand the practical implementation of this strategy to cities. As a solution, these flood-prone areas can be converted to public open spaces with designated uses. Confirming this, Kubal, Haase et al., (2009) state that preserved land in flood prone areas can potentially be converted to public open spaces promoting wildlife habitat and recreational activities. This can be a vital solution to get the highest and best use of land in rapidly urbanizing areas and at the same time, as a strategy for disaster resilience.

This notion is correspondingly applicable to most of the other types of hazards. For instance, the research discussions on minimizing the effect of Tsunami, suggest to demarcate the development setback line through the integration of land use maps and Tsunami hazard maps (Amarathunga, Haigh et al., 2015) and then to use the protected areas for open spaces. In supporting this view, Ardekani and Hosseini (2012) propose that these preserved areas from development setbacks, have the potential to be used for agriculture, open-space or scenic amenity. Accordingly, it can be understood that in a city, hazard prone area have the potential to be converted to Public Open Spaces contributing to disaster mitigation and also to the everyday use of the city.

## **5. Discussion: Necessity of Planning and Designing Inputs**

Above discussion revealed the potential role of public open space as a strategy to make disaster resilience cities, as a facilitator for emergency evacuation, as an agent of recovery and as a strategy for disaster mitigation. However, these potentials cannot be effectively harnessed without considering the practical implementation side of it. Accordingly, this section is focused towards the current issues and problems of using Public Open Spaces for disaster resilience in cities. Further, the researcher propose set of the potential strategies that can be used to overcome these problems through a literature analysis on potential concepts, theories and practices of urban planning and urban designing.

### **5.1 PLAN FOR EVERYDAY USE**

As it was identified, the public open spaces have the potential to be used for emergency evacuation and recovery in disaster situations and can act as an essential life support in an event of emergency. In practice, most of the recovery planners identify the open spaces as a component of the natural environment under emergency management plan but not as a part of the built environment. However, as Allan and Bryant (2010) point out, if these open spaces are planned and designed for the only purpose of emergency planning



and recovery without having any connection with everyday life of the city, these places will become isolated in long run and result to have unstructured open spaces which are not physically prepared and not identified by the public in an event emergency. Further, this is not practical in a city where the rapid urbanization is taking place and not rather compatible with sustainable city concept.

As a solution, these open spaces can be planned and designed as ‘public open spaces’ in a way to function well in both emergency and non-emergency time. Confirming this, Allan and Bryant (2010) highlight that the emergency management plans and recovery plans become more effective when it is aligned with everyday life of the city through urban planning and designing strategies. León and March (2014) further confirm the necessity of planning and designing public open spaces to function well, during both emergency and non-emergency times through their study on Tsunami rapid resilience. Accordingly, it can be understood that, for the effective use of public open space as a strategy for emergency recovery and mitigation, it needs to be planned and designed, aligned with everyday life of the cities.

## 5.2 NETWORK OF PUBLIC OPEN SPACES

The literature analysis identified that, connectivity is one of the main factors which effects for the effective use of Public Open Spaces in emergency management and recovery. At the same time, it has been discussed that, after a disaster, city’s open spaces have the potential to act as a ‘second city’ contributing simple to complex services such as gathering, sheltering, distribution of goods and service and temporary inhabitation etc. Further, Allan and Bryant (2010) suggest that the successful integration of recovery planning and urban design, facilitate to look at city’s open spaces as a ‘second city’ with network of open spaces. In supporting this view, Fuentes and Tastes (2015) further confirms the idea of design public open space network for the urban resilience. Accordingly, this discussion emphasize the importance of planning and designing a network of Public open spaces contributing both urban resilience and disaster resilience.

At the same time, urban planners and designers demonstrate the benefits of having interconnected Public open spaces system in cities. Confirming this, Rogers and Sukolratanameteer (2009) state that integrated network of parks and open space can promote the walkability, promote the interlinked recreational facilities, beneficial for neighbourhood designs and can be used to facilitate the sense of community. Further, Carmona (2010) says network of open spaces linked with green corridors integrate the natural and the built environment which is a key to create cities sustainable environment. Accord-

ingly, it can be understood that, designing a network of Public open spaces have the potential to facilitate both disaster resilience, urban resilience and sustainable cities. However, this need to be done in line with the fact of design for everyday life of city which was discussed at the previous section.

At the same time, it was identified the need of different typologies of open spaces contributing to different functions of disaster aftermath. This factor can be amalgamate with the planning concept of having variety of Public Open spaces contributing variety of needs of the city. As Thompson (2002) state, the diversity of public open spaces and their individual characters invite different uses and contribute the city's functionality, vitality and sustainability. Further, Carmona (2010) states that the external public open spaces provide life breath to the cities by adding recreational opportunities, venues for special events, wildlife habitats and opportunities for the movement of the people. Accordingly, it can be understood that planning and designing network of public open spaces focusing both disaster resilience and sustainable cities should also encompass the notion of different typologies of spaces contributing different functions of the city and as well as the factors of disaster resilience framework.

### 5.3 LOOSE SPACE

However, Planning and designing different typologies of public Open spaces to function well in both emergency and non-emergency situation, is not a simple task. For instance, planning and designing for everyday life may include the factors such as seating facilities, promote walkability, space for cycling, space for different recreational activities and children play areas, green spaces and so on. Further, as it was discussed, planning for disaster resilience may include facilitating emergency evacuation, sheltering, first aid and so on. Therefore, in order to function well in both of these situations, the identified public open spaces need to be planned and designed in a flexible manner allowing variety of uses.

However, addressing multiple objectives, the elements of 'Loose-fit' concept can be potentially used to plan and design public open spaces allowing variety of functions. The studies of Franck and Stevens (2013) explore that 'Loose-Fit' environments are not planned and designed for the specific tighten use. It is more unregulated, loose, open-ended and the user will decide the use of the space, rather than following the decisions of the urban planner or designer. In supporting this view, Thompson (2002) state, "Found" spaces often serve people's wide range of needs in ways that designed spaces do not. Applying the same theory, if the Public Open spaces

can be planned and designed as a 'Loose space' offering the sense of freedom to the user, that Space have the potential to function well in both everyday life and in disaster situation.

#### 5.4 MITIGATION AND URBAN SPONGE PARK

Most of the literature findings which discuss the use of open spaces to mitigate the disaster impact, consider the open spaces as a conservation and preservation strategy but not as an asset to the city. As an example, Burby and French (1981) and White and Richards (2007) state that most common way of protecting flood prone area, is preserve the flood-prone area as open space. It was also discussed that these preserved land have the potential to be used as Public spaces. Moving another step forward, Drake and Kim (2011) introduce the concept of Urban Sponge Park which marries the storm water engineering, urban design, and urban habitat concepts. Using this concept, they converted a large marshy wetland area in Gowanus, in to a new site for large residential development. Under this master plan, the parks were designed as a working landscape, proposing strategies to divert excess storm water run-off for use in the public park along the canal, thus reducing the load into the sewer system. Likewise, this concept of urban sponge park have the potential to be used to achieve multiple objectives including liveable cities which are physically feasible, environmentally sustainable and disaster resilience built environments.

Further, the potential conversion of hazard prone areas to public open spaces does not mean an additional development in vulnerable areas, but it should be planned and designed to make the use of hazard-prone areas safer to the community and wise use of the space in cities. Accordingly, this discussion shows the potential of planning and designing urban hazard prone areas as Public open spaces addressing multiple objectives incorporating sustainability, disaster resilience, liveable community, protecting open space or wildlife habitat, enhancing economic vitality, and promoting social equity, and benefiting to future generation.

#### 6. Conclusion

This paper has offered an overview of the use of public open space as a key spatial element to enhance the disaster resilience in cities by mean of a critical analysis and synthesis of literature. Further, this study attempts to deliver the message, that current planning and designing focus on public open spaces should not be limited to the factors such as increasing scenic beauty, improving the environmental health, economic growth, increasing the walk-

ability, liveability and vitality of a city and creating sustainable cities. Nevertheless, the focus should also be expanded towards the disaster resilience as an emerging need of sustainable cities.

Accordingly, the literature analysis first discusses the potential uses of Public Open spaces as a facilitator for emergency evacuation, as an agent of recovery and as a strategy for mitigation. Further, the discussion section points out the current issues and problems associated with harnessing these potential uses. Finally, this paper suggest the potential planning and design interventions that can be incorporated when using public open spaces for disaster resilience cities. In conclusion, the factors which have been discussed in this paper can be framed as follows (Figure 1), as a preliminary framework to plan and design public open spaces for sustainable disaster resilience cities.

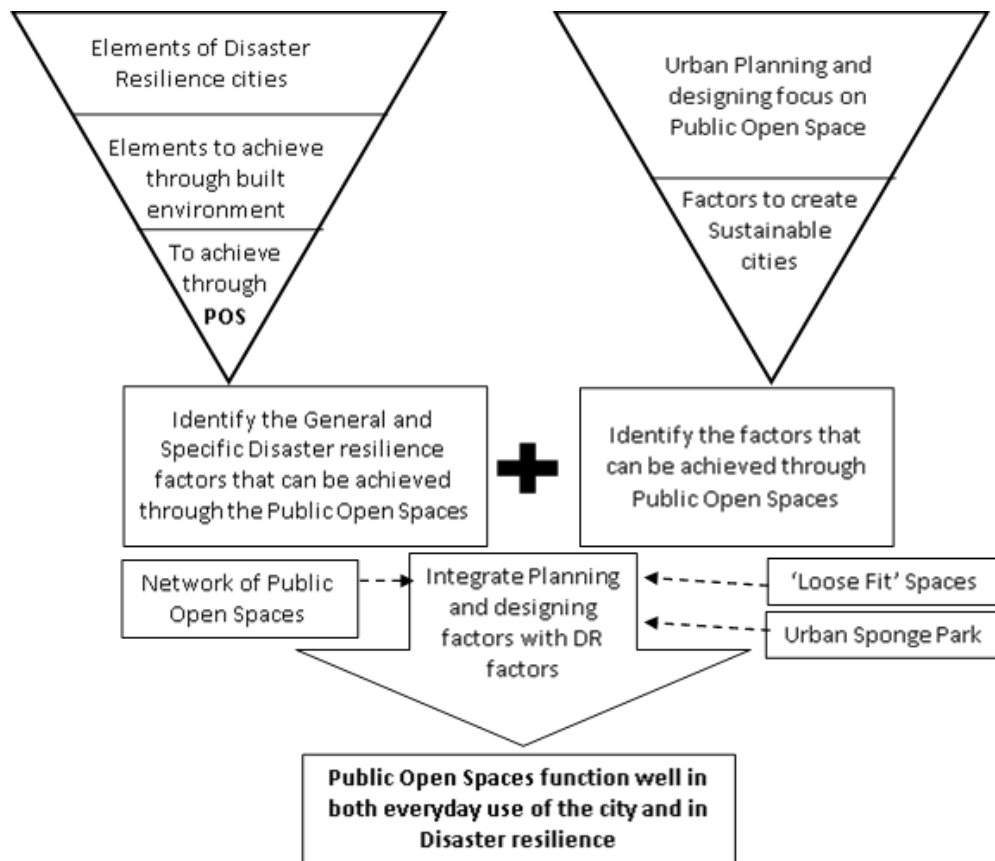


Figure 1, Framework to plan and design public open spaces for sustainable disaster resilience cities

## References

- Allan, P. and M. Brytan 2010, *The critical role of open space in earthquake recovery: a case study*, EN: Proceedings of the 2010 NZSEE Conference (2010, Nueva Zelandia).
- Amarathunga, D., R. Haigh, J. Villagran de Leon, S. Hettiarachchi, P. Dias, E. Kissling, H. Rahayu, R. Sharma and R. Arthurton 2015, *Tsunami risk assessment and mitigation for the Indian Ocean; knowing your tsunami risk – and what to do about it*, Paris UNESCO.
- Ardekani, A. and M. Hosseini 2012, *Urban and Architectural Approaches to Design against Tsunami*, Proceedings of the 15WCEE, Lisbon, Portugal: 24-28.
- Burby, R. J. and S. P. French 1981. *Coping with floods: the land use management paradox*, Journal of the American Planning Association 47(3): 289-300.
- Carmona, M. 2010, *Public places, urban spaces: the dimensions of urban design*, Routledge.
- Drake, S. C. and Y. Kim 2011, *Gowanus Canal Sponge Park*, Ecological Restoration 29(4): 392-400.
- Franck, K. and Q. Stevens 2013, *Loose space: possibility and diversity in urban life*, Routledge.
- Fuentes, C. W. and M. T. R. Tastes 2015, *The role of open space for urban resilience: A case study of San Pedro de la Paz under the context of the 2010 earthquake in Chile*, 7th i-Rec Conference 2015: Reconstruction and Recovery in Urban Contexts.
- Giles-Corti, B., M. H. Broomhall, M. Knuiiman, C. Collins, K. Douglas, K. Ng, A. Lange and R. J. Donovan 2005, *Increasing walking: how important is distance to, attractiveness, and size of public open space?*, American journal of preventive medicine 28(2): 169-176.
- Hossain, N. 2014, *Street as Accessible Open Space Network in Earthquake Recovery Planning in Unplanned Urban Areas*, Asian Journal of Humanities and Social Sciences (AJHSS) 2(4).
- Huq, S., S. Kovats, H. Reid and D. Satterthwaite 2007, *Editorial: Reducing risks to cities from disasters and climate change*, Environment and Urbanization 19(1): 3-15.
- Kubal, C., D. Haase, V. Meyer and S. Scheuer 2009, *Integrated urban flood risk assessment – adapting a multicriteria approach to a city*, Natural Hazards and Earth System Science 9(6): 1881-1895.
- León, J. and A. March 2014, *Urban morphology as a tool for supporting tsunami rapid resilience: A case study of Talcahuano, Chile*, Habitat International 43: 250-262.
- Malalgoda, C., D. Amaratunga and R. Haigh 2013, *Creating a disaster resilient built environment in cities: The role of local governments in Sri Lanka*, International Journal of Disaster Resilience in the Built Environment 4(1): 72-94.
- Pelling, M. 2012, *Hazards, risk and urbanization*, The Routledge Handbook of Hazards and Disaster Risk Reduction: 145-155.
- Rogers, G. O. and S. Sukolratanamete 2009, *Neighbourhood design and sense of community: Comparing suburban neighbourhoods in Houston Texas*, Landscape and urban Planning 92(3): 325-334.
- Swanwick, C., N. Dunnett and H. Woolley 2003, *Nature, role and value of green space in towns and cities: An overview*, Built environment 29(2): 94-106.
- Thompson, C. W. 2002, *Urban open space in the 21st century*, Landscape and urban planning 60(2): 59-72.
- UNISDR 2012, *How To Make Cities More Resilient- A Handbook For Local Government Leaders-A contribution to the Global Campaign 2010-2015- Making Cities Resilient – My City is Getting Ready!*. Geneva, The United Nations Office for Disaster Risk Reduction
- Vargas-Moreno, J., B. Meece and S. Emperador 2014, *A framework for using open green spaces for climate change adaptation and resilience in Barranquilla, Colombia*.
- White, I. and J. Richards 2007, *Planning policy and flood risk: The translation of national guidance into local policy*, Planning, practice & research 22(4): 513-534.

- Woolley, H. 2006, *Freedom of the city: Contemporary issues and policy influences on children and young people's use of public open space in England*, *Children's Geographies* 4(01): 45-59.
- Zhang, X. Q. 2015, *The trends, promises and challenges of urbanisation in the world*, Habitat International.