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'Build back better' principles for land-use planning

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This paper examines post-disaster land-use planning practices for risk reduction using 'build back better' (BBB) principles. The 2004 Indian Ocean tsunami and the 2009 Victorian bushfires were chosen as case studies to explore to what extent BBB principles were implemented, as well as their implications and lessons learnt for future practice. Successes and challenges faced in both cases were similar, allowing the establishment of universally applicable BBB-based land-use planning recommendations. Ongoing multi-hazard assessments must be conducted and used to create risk zone maps, which should be employed to plan developments and enforce planning and building regulations. High-risk lands should be avoided for residential and commercial developments by using strategies such as buy-back schemes. Consideration of social issues and community needs must be a priority during relocation. Keeping the community informed and educated is essential. Engineers and planners should use these principles in post-disaster as well as pre-disaster periods to reduce risks and build safe communities.

1. Introduction

'Build back better' (BBB) is a concept formerly introduced following the Indian Ocean tsunami, which represents using the reconstruction phase to create a new 'normalcy' in affected communities with improved physical, social and economic conditions creating improved resilience (FEMA, 2000; James Lee Witt Associates, 2005; Khasalamwa, 2009; Roberts, 2000). The former US president Clinton (2006) published a guideline presenting 10 propositions to achieve BBB, which emphasise that recovery should enhance community safety through risk-reduction measures and support economic recovery with effective collaboration and cooperation of stakeholders using a community-centred approach (Figure 1). Other frameworks and guidelines published recommending how BBB concepts can be implemented to achieve a successful recovery operation include the holistic recovery framework in Monday (2002), the paper 'Building back better: way forward' (Disaster Relief Monitoring Unit of the Human Rights Commission of Sri Lanka, 2006) and *Rebuilding for a more Sustainable Future: An Operational Framework* (FEMA, 2000), which are in agreement with Clinton (2006).

Analysis of the above guidelines and recommendations from international research shows three key concepts that represent BBB (Figure 2)

(*a*) risk reduction, which focuses on structural and land-use planning measures to reduce the vulnerability of the built environment
(*b*) community recovery, which entails supporting psycho-social and economic recovery
(*c*) implementation, which addresses the means by which risk reduction and community recovery initiatives can be executed efficiently through better coordination and management of stakeholders, modified legislation, inclusion of communities and diligent monitoring and evaluation of recovery activities.

This paper focuses on BBB-based land-use planning for risk reduction to improve the physical resilience of communities to natural hazards using examples from two case studies: the 2004 Indian Ocean tsunami in Sri Lanka and the 2009 Victorian bushfires in Australia. The land-use planning measures implemented in both countries and their implications are examined to determine similarities and differences between the two cases, leading to an analysis of whether BBB principles for risk reduction could be suitable for wider adoption.

2. Land-use planning using BBB principles

The occurrence of a major disaster event questions the safety of a community's location and whether the community should be relocated to a lower risk area. The damage from the 2004 Indian Ocean tsunami (DN and PA, 2008) and the 2009 Samoan tsunami (Bird *et al.*, 2011) was partly due to insufficient consideration of coastal risks in land-use planning. BBB advocates that during reconstruction hazard-resistant structures are to be built with better consideration of land-use planning to minimise damage from future natural hazards (Kennedy *et al.*, 2008; Palliyaguru and Amaratunga, 2008). The post-disaster recovery efforts of the Indian Ocean tsunami and the Samoan tsunami both resulted in the relocation of

Figure 1. Constituents of 'build back better' for post-disaster reconstruction and recovery

Figure 2. Bill Clinton's 10 build back better propositions

coastal communities further inland to prevent future impacts of coastal hazards see unpublished research paper 'Native engineering technologies: the 2009 Samoan tsunami and its significance for New Zealand' by Potangaroa and Kennedy *et al.* (2008). The mandatory resettlement operations in Sri Lanka and Samoa were problematic owing to the lack of consideration given to the lifestyles of the local people, which led to the loss of their sea-dependent livelihoods, dissatisfaction with the new settlements and illegal return of people to their original coastal lands (Birkmann and Fernando, 2008; Frerks and Klem, 2005; Kennedy *et al.*, 2008). A recurring issue with relocation is the focus given to moving communities away from a certain hazard, resulting in exposing communities to new unanticipated hazards (Mora and Keipi, 2006; Red Cross, 2010). Oliver-Smith (1991) recommends attempting to rehabilitate original sites first, with resettlement considered as a last resort.

Hazard assessments of current land sites and possible new land sites, and creating risk zone maps, which are used to determine appropriate land uses and new planning and building regulations, are recommended BBB practice (Baradan, 2006; Haigh *et al.*, 2009; Iglesias *et al.*, 2009). The risk zone maps should be legislated and included in council development plans and approval permit procedures to ensure compliance (DMC, CCD and ADPC, 2011; Glavovic, 2010; Iglesias *et al.*, 2009). Examples such as Taiwan's mitigation plans, the Philippines' municipal maps and the Christchurch city plan in New Zealand following the Canterbury earthquakes display successful application of BBB measures to create safer developments (Batteate, 2005; CERA, 2011; Iglesias *et al.*, 2009). Development may be restricted in areas with high levels of risk where the adoption of structural enhancements is not economically feasible (James Lee Witt Associates, 2005).

Well-intended land-use planning measures can fail owing to the lack of knowledge and awareness of local people, who do not conform to new regulations, and the lack of experience and knowledge of local governing authorities, who do not enforce new regulations (DFID, 2004; Kennedy *et al.*, 2008). Olsen *et al.* (2005), Glavovic (2010) and DN and PA (2008) encourage educating communities about risks and the importance of risk-reduction measures and engaging them in collective risk-reduction efforts. The participatory flood risk communication support system (Pafrics) developed in Japan to educate locals and other stakeholders, including non-governmental organisations (NGOs) and local governments, on flood risks and risk management strategies is an example of a participatory tool (Ikeda *et al.*, 2007).

3. Research methodology

The 2004 Indian Ocean tsunami and the 2009 Victorian bushfires were chosen as case studies to examine the land-use planning decisions taken in the post-disaster recovery efforts in Sri Lanka and Australia. The Indian Ocean tsunami was chosen because this disaster initiated the concept of BBB and provides a valuable resource on how BBB was implemented originally, as well as the long-term impacts BBB has had over time. The Victorian bushfires case was chosen to investigate how much the concept of BBB has been integrated in post-disaster recovery operations in a more recent event. The differences between the two chosen case studies, such as the different economic situation, population density, type of hazard, governmental and administrative structure, culture and ethnicity provide the opportunity to analyse the universality of the BBB concepts. Qualitative data were collected for the two case studies by visiting the impacted areas in Sri Lanka and Australia and conducting semi-structured interviews with stakeholders. In total, 15 people from Sri Lanka and 25 from Australia were interviewed. Interviewee details are presented in Tables 1 and 2. Participants were asked to comment on the implementation, implications, challenges and recommendations for land-use planning in the post-disaster practices of each country using a standard set of questions. Evidence from post-disaster documents produced, including progress reports, commission reports and governmental authority reports, assisted with validating the findings.

Sri Lanka was chosen to represent the Indian Ocean tsunami disaster, being the second most affected country after Indonesia (UNDP, 2010) where data were collected in 2011, 7 years after the tsunami, to look at long-term impacts. The stakeholders interviewed (Table 1) were from national-level governmental

Interviewee code	Number of interviewees	Organisation
P1–P5	5	Disaster Management Centre (DMC)
P6	1	Asian Disaster Preparedness Centre (ADPC)
P7	1	United Nations Development Programme (UNDP)
P8	1	Practical Action (PA)
P9	1	Coastal Conservation Department (CCD)
P10	1	National Building Research Organisation (NBRO)
P11	1	Care International
P12	1	Urban Development Authority (UDA)
P13	1	Galle Municipal Council
P14	1	Galle Divisional Secretariat
P15	1	Peraliya School

Table 1. Profiles of the interviewees for Sri Lanka (source: author)

Research trip	Interviewee code	Number of interviewees	Description
	P16–P24	9	Victorian Bushfire Reconstruction and Recovery Authority (VBRRA)
	P25 and P26	2	Building Commission
	P27	1	Temporary village
	P28	1	Local council
	P29 and P30	2	Volume builders
Research trip 1, July 2010	P31 and P32	2	Department of Human Services (DHS)
	P33	1	Fire Recovery Unit (FRU)
	P34	1	Building Commission
	P35	1	Office of Housing, DHS
	P36	1	Department of Planning and Community Development (DPCD)
	P37	1	Economic Recovery, FRU
	P38	1	FRU
	P39	1	Marysville Community Recovery Committee
Research trip 2, July 2011	P40	1	Marysville Chamber of Commerce

Table 2. Profiles of the interviewees for Australia (source: author)

regulatory authorities (CCD, UDA) who were responsible for development plans and land-use regulations; local governmental authorities (Galle Municipal Council, Galle Divisional Secretariat) who implemented recovery activities at the local level, NGOs (UNDP, ADPC, Practical Action and Care International) who were involved in rebuilding work and dealt closely with affected communities, a local affected school (Peraliya school) to provide a community perspective, and the DMC, which is the national-level organisation established under the Sri Lanka Disaster Management Act No. 13 of 2005 (GoSL, 2005) after the tsunami to coordinate disaster management activities in the country.

The Victorian bushfires-affected sites were visited on consecutive years in 2010 and 2011. The stakeholders interviewed (Table 2) included officials from the recovery authority established to oversee the recovery and reconstruction activities (VBRRA and FRU), government officials in charge of community recovery (DHS), officials involved with structural regulation changes (Building Commission), rebuilding advisors who helped the community with rebuilding (VBRRA and FRU), builders, local council for the local council perspective, town planners who were developing the new urban plans (VBRRA), and representatives from local community organisations who were involved in grass-roots-level activities, such as community consultations and economic recovery (Marysville Chamber of Commerce).

An inductive approach using the grounded theory and the constant comparative method was used to analyse the data using the computer programme NVivo 9. The interview data were transcribed and compared across the two case studies to identify how each principle was adopted, their corresponding implications and challenges, and the lessons learnt.

4. Land-use planning for post-disaster risk reduction in Sri Lanka and Australia

The tsunami waves resulting from the 9·0 magnitude earthquake, which occurred off the coast of Sumatra, Indonesia on 26 December 2004, affected 25 coastal districts in the east and south of Sri Lanka, where 35 322 lives were lost and 516 150 people were displaced (Asian Development Bank *et al.*, 2005; Frerks and Klem, 2005). The primary risk-reduction strategy implemented in Sri Lanka was a 'coastal buffer zone' banning construction along the coastal strip, which was considered a high-tsunami-risk zone, followed by relocation of the people who previously lived within the buffer zone areas (Boano, 2009; Frerks and Klem, 2005; Kennedy *et al.*, 2008). Boano (2009) described the buffer zone as 'the single greatest barrier to progress' in post-tsunami reconstruction, and the research reported in this paper found that the lack of transparency about the buffer zone created confusion. The buffer zone resulted in two reconstruction policies: buildings that were previously within the buffer zone were to relocate outside the buffer zone, whereas buildings that were outside it were to be rebuilt in situ (Mulligan and Shaw, 2007). The decision made to relocate caused problems for recovery in Sri Lanka. One of the issues with relocation was the scarcity of suitable available lands for relocation (Mulligan and Shaw, 2007). Interviewee P11 stated that 'there was not enough available state land. The ones that were available had problems with water availability,

infrastructure, illegal encroachment of land by other people who couldn't be removed straight away', which caused delays in reconstruction. Findings by Kennedy (2009), Khazai *et al.* (2006) and Boano (2009) show how tsunami-affected people have been exposed to other hazards such as flooding, landslides and cyclones during relocation. Interviewee P8 commented that 'it can be seen that some sea-side people were actually relocated to flood-plains, thus introducing them to a new disaster.' A major downfall to relocation seen in Sri Lanka was the negative impact it had on people's livelihoods (Kennedy, 2009; Khazai *et al.*, 2006). Interviewee P14 said that 'the reconstruction concept was providing a 'house for a house'. We weren't concerned with aspects like livelihood. We identified vacant land, built houses and let them settle in.' Interviewee P10 attributed the failed relocation effort to the absence of having a proper resettlement strategy.

On the other hand, evidence from P14 recounted a success story in Habaraduwa (RADA, 2006), a southern coastal city in Sri Lanka, where hazard assessments of new lands, thorough data collection and consideration given to people's needs enabled a positive outcome from the resettlement process: 'Compared to other housing sites I felt that we were successful. We had very minimal complaints at the end.'

The lessons learnt from the tsunami experience have led to improved land-use planning practices in Sri Lanka, with a good example being the Hambantota city redevelopment project (UDA, 2010) as explained by the Urban Development Authority interviewee: 'After the tsunami we reviewed existing plans and introduced a different zoning system. Based on hazard assessments done, 'no-development' zones were identified where alternate activities have been introduced, and 'safe places', which are areas free from vulnerabilities. All new settlements have been located in the 'safe' areas.' Another example of good hazard-based land-use practice is the 'Strategic environmental assessment for Northern Province' project established in the north of Sri Lanka for post-conflict housing, explained interviewee P7.

The Victorian Bushfires of 7 February 2009, swept through 78 communities in the state of Victoria, with 173 lives lost; more than 430 000 hectares of land, 2000 properties, 55 businesses, 3550 agricultural facilities, 70 national parks, 950 local parks and 467 cultural sites were destroyed (VBBRA, 2009). The land-use planning strategy implemented in Australia was first to declare the whole of Victoria as bushfire prone under the Country Fire Authority's wildfire management overlay (WMO) map, where construction within the WMO areas required planning and building permits as well as compliance with the revised building code, as recommended by the Victorian Bushfire Royal Commission (2010). Subsequent to more thorough hazard analysis of the land, interviewee P34 explained that 'now they are working on a site assessment system called the Bushfire Management Overlay (BMO) in place of the WMO which integrates the WMO and building code specifications. The BMO will have three risk categories: low, where you don't have to do anything in terms of bushfire construction, medium meaning complying with the building code and having a building permit, and high where you need a planning permit, building permit and compliance with the building code.' However, it was observed that, similarly to Sri Lanka, regulations in the rebuild were only concerned with bushfire risk, whereas other hazards were looked at separately: 'Different authorities look at different hazards. For example if the Drainage Authority declares the land as flood-prone, separate regulations will apply. But it's not done together with bushfire maps' (interviewee P19). Interviewee P33 said 'one of the Royal Commission recommendations was for the Government to buy back high risk properties. The Government has set aside $5 million to buy back 150 houses in high bushfire-risk zones', which is the strategy put in place to deal with costly construction on high-risk lands. The optional 'buy-back scheme', which was implemented in March 2012 showed mixed results (Department of Justice Victoria, 2012), where people were sceptical about whether allocated funds would be better spent providing extra protection for buildings on original lands, and what impact vacant lands would have on neighbouring properties who have not opted for the scheme (Akerman, 2010). Interviewee P33 shared the scepticism: 'If one property is bought back while the others around are still owned by people and have homes on them, who will maintain the empty lot? It will make the bushfire risk for the remaining homes greater.' There were also cases where those who were interested were not eligible for the scheme (Gray, 2011). Although reconstruction poses an opportunity to review town-planning layouts no significant changes were made in the affected towns. Stated interviewee P38: 'There was an opportunity and plans were put out and were open to consultation, but the people didn't say anything.'

Apart from the specific challenges in each case study presented above, there were several common issues in both countries. Interviewees P9 and P39 both remarked on the desire of people not to relocate owing to their attachments with their lands and the community, and the impact it would have on livelihoods. There was also confusion seen regarding new regulations implemented in both case studies, which led people to ignore regulations to avoid inconveniences. Interviewees P8, P11 and P12 stated that the ambiguity of the buffer zone rule and the impact it had on people's livelihoods in Sri Lanka led some of the population to remain illegally within the buffer zone. Seen in both case studies is the lack of systems put in place to monitor and maintain hazard-prone properties to minimise risks in the long term. P2 from Sri Lanka stated: 'A major problem is that proper maintenance of the systems is non-existent', and P18 from Australia: 'There really isn't any

long-term maintenance or monitoring in place at the moment. As vegetation grows the BAL rating will increase and an issue arises with neighbours if they don't clear and maintain their vegetation.'

5. Implementation of improved land-use plans in accordance with BBB principles

The results from both case studies show that one reason for the devastation caused by the respective disasters was the lack of recognition of potential hazards during the pre-disaster phase. The importance of carrying out multi-hazard identification to ensure that land-use, design and construction measures are able to provide the best possible protection to communities was overlooked.

The adoption of land-use planning for risk reduction showed similarities in the two case studies, where the first response in both countries was to introduce a blanket reservation for the affected areas, identifying them to be at higher risk from the encountered hazard. High-risk identification is effective in alerting people and building practitioners to exercise more caution when building in these areas. However, applying blanket reservations such as the coastal buffer zone in Sri Lanka did not work well. The main reason for the failure was the impracticality of this rule in terms of people's livelihoods, which led people to move back to coastal areas illegally. In Australia, application of the WMO declaring the whole of Victoria as bushfire prone in Australia resulted in all properties having to comply with extra regulations that were time consuming and costly. On the other hand, not completely banning rebuilding on high-risk lands in Australia resulted in some people settling down on the same lands without adequate bushfire protection (interviewee P18), making them highly vulnerable. Both countries recognised over time that more accurate hazard assessments needed to be done to categorise the land into zones, after which appropriate planning and building controls could be enforced. The introduction of the BMO in Australia and projects such as the Hambantota redevelopment project in Sri Lanka are good examples of BBB-based land-use planning. Because performing accurate hazard assessments is time consuming, a possible option in post-disaster environments is to rely on temporary settlements until the assessments and zoning work is completed.

The major challenges encountered with implementing land-use plans for risk reduction were common to both case studies, and included: focus given only to the immediately encountered hazard during reconstruction; unwillingness of people to relocate even from high-risk lands; confusion regarding new regulations resulting in non-compliance; and lack of systems in place to maintain risk-reduction practices. The tendency to focus only on the immediately encountered hazard during reconstruction was observed in both case studies. The consequences of incomplete hazard assessment practices were witnessed in Sri Lanka, where people who were relocated from coastal areas to escape tsunami risk were exposed to flood risks in the new settlements, showing the need to work from integrated hazard maps containing up-to-date multi-hazard information. Such maps allow all necessary risk-reduction measures to be taken during reconstruction. Using integrated hazard assessment practices would help to simplify permit procedures.

The desire of people not to relocate owing to their attachments with the land, the community and the impact it would have on their livelihoods was seen in both case studies. The difficult resettlement process executed in Sri Lanka led to the loss of the sea-reliant livelihoods of many people, and the unavailability of appropriate vacant lands led to the use of hazard-prone lands without proper infrastructure. These problems illustrate a need for a comprehensive resettlement strategy, which takes all these matters into consideration. Relocation should be a last resort option, and must only be chosen if it can provide improved safety for the people by moving them to low-risk lands with adequate infrastructure, business and livelihood opportunities, and educational, health and recreational facilities.

Confusion about new regulations in a post-disaster environment was apparent in the case studies examined, which led to non-compliance and unregulated land use. The provision of training and education workshops to the local community, as well as other stakeholders such as builders, local council members, designers, planners and inspectors, is important to inform and educate them about the reconstruction process. Interviewees P2 and P18 stated that although risk-reduction practices were adopted during reconstruction the lack of maintenance to ensure continued risk reduction could exacerbate risks again. Therefore long-term continuity of risk-reduction practices, such as staying away from coastal areas to prevent tsunami risk, not blocking natural drainage paths to prevent flooding, not constructing on slopes to prevent landslides, maintaining vegetation growth to reduce bushfire risk and other applicable measures, have to be encouraged. Greater awareness is the key to adopting risk-reduction practices.

The risk-reduction practices for BBB explained above can also be applied during the pre-disaster period by incorporating them into new developments using ongoing multi-hazard assessments and updating planning and building regulations to help maintain safe communities.

6. Recommendations for implementing BBB-based land-use planning for practitioners

Accurate multi-hazard assessments and the creation of risk zone maps that are coordinated with structural regulations, as

opposed to placing blanket 'high-risk' reservations for all affected areas, should be used for making risk-based land-use plans and relevant building regulations before post-disaster reconstruction begins. High-risk lands should be avoided for residential and commercial developments, while existing developments on high-risk lands should be encouraged to relocate to safer areas using compulsory 'buy-back' or 'land-swap' schemes. A comprehensive resettlement strategy must be created for relocation operations that take into account risk levels of new lands, community preferences, and livelihood and lifestyle opportunities offered in the new locations, and should be implemented with community consent. Legislation and permit procedures must be used to mandate BBB-based land-use plans. Educating the community and stakeholders about risk reduction, the recovery process, new regulations and support available through workshops, training sessions and multi-media information dissemination are fundamental for successful implementation and maintenance of risk-reduction practices.

Pre-disaster periods should be used to implement BBB risk-reduction measures to enhance the resilience of communities before a disaster strikes by identifying high-risk locations and incentivising existing developments to relocate. Ongoing multi-hazard assessments must be put in place and these assessments should be used to create appropriate up-to-date planning and building regulations.

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