Field Report

A Nexus of Social Justice, Tradition, and Disaster Risk Reduction in Balakot, Pakistan: Fostering Independence or Dependence?

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A major cause for the massive destruction brought by the 2005 earthquake in Balakot, Pakistan, was structural collapse. Yet it has been revealed by a local NGO that some local people are still using the same post-and-lintel construction methods that failed in the earthquake. Why do these people continue to use an unsafe technology? What is preventing them from employing traditional practices of timber-based earthquake-resistant construction? Alternatively, why don't they adopt other safe construction practices? Does this represent a simple gap in awareness or affordability, or is it the culmination of a more complex socio-political dynamic? This report investigates the uptake of alternative low-cost technological systems in the wake of efforts by the government and international aid agencies to implement more high-cost solutions in the area. Of particular interest is the case of the award-winning Cal-Earth model. The viability of this building system was demonstrated through the construction of approximately 500 small emergency shelters in 2006, but it has since been unable to capture the interest of local people. A key finding is that the lack of uptake is due to a gap between this model's actual and perceived benefits. The report concludes this gap may be reduced by encouraging meaningful participation by local people in construction-technology decisions. However, a bigger issue in this and similar situations is the social-justice aspect of introducing alternative technologies in disadvantaged communities when such interventions foster dependence instead of independence.

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What happens when traditional building practices are based on a particular material and that material vanishes? And what if the context in question is a region of high seismic risk where traditional practices had offered vital protection from disasters? This is the backdrop against which a 2005 earthquake wreaked havoc in Balakot, Pakistan. In all, 70,000 lives were lost, including 20,000 children. This report focuses on post-earthquake interventions. In the years since the earthquake, mainstream rebuilding initiatives have fostered dependence by introducing costly technologies that rely on socio-culturally crippling financing regimes. Approaches are needed that instead promote social justice through the conservation of local independence.

In 2006, in the wake of the destruction of large sections of the city of New Orleans as a result of Hurricane Katrina, Neil Smith wrote that "there is no such thing as a natural disaster. . . . [T]he contours of disaster and the difference between who lives and who dies is . . . a social calculus."[1] Smith's observation echoes a point raised more than two centuries ago by Jean-Jacques Rousseau in a letter to Voltaire with regard to the loss of life during Lisbon's 1756 earthquake. As Rousseau succinctly pointed out, "nature did not construct . . . [the] . . . houses."[2]

Together, these views offer an apt backdrop for contemplating responses to the structural failures that occurred during the 2005 Balakot earthquake.[3] People of this region have almost a millennium-old tradition of earthquake-resistant construction, which was literally stolen from them in the last century and a half due to the depletion of local timber resources by indiscriminate, government-sanctioned deforestation.[4] Stripped of their tradition, and as yet lacking a commensurate alternative, the people of Balakot are desperately in need of safe new building practices.

Such conditions may appear to present a straightforward technical problem. But their resolution, in fact, raises the complex social and environmental-justice question of whether intervention should foster dependence or independence.[5] Fostering independence will ultimately require addressing the asymmetrical power relation between disadvantaged communities and interveners, which is inevitably brought in along with "externalities." Specifically, it will require that technological solutions be designed so that this asymmetry may be worked back out of them.[6] The opposite condition is more typically the case, however, as interveners exploit the vulnerability of disadvantaged people and perpetuate their privileged position with deliberate intent to pursue vested interests. In Balakot, it appears that higher-order concepts of social and environmental justice have been bypassed in favor of just such an exploitative approach — albeit perhaps more the result of a sincere but negligent (or, at best, less-than-fully-rigorous) intervention by outside organizations.

A decade after the disaster, a vivid example of such exploitation is the New Balakot City debacle, in which people displaced by the earthquake were asked to relocate to a newly planned township that never materialized.[7] Now, with no respite in sight from the hardships they have borne, news accounts speculate that these victims were in fact used as bait to attract international aid, which was duly siphoned off by middlemen.[8] It is the underlying attitudinal injustice of such efforts that the present report aims to explore. To do so, observations by the first author from site visits have been combined with citations from published work to analyze the situation and suggest alternatives.

At the outset, it is useful to emphasize that the per-capita income level in Pakistan is among the lowest in the world, and that the mountainous region where Balakot is located (known as the Northern Areas) is one of the country's most impoverished.[9] Yet this region is also rich in cultural values such as engaged communal living, warm hospitality, and magnanimous friendliness.[10] Likewise, its architectural tradition, if compared to the glamour of modern Western cities, may appear simple, but it has deep roots in both family-oriented domestic social life and a rugged mountainous terrain and cold winter climate.[11]

Various scholars have carried out extensive documentation of the centuries-old buildings still standing at some locations in the area. These are masterpieces in their own right, exhibiting a captivating combination of the frugal use of local materials and a sensitive and ingenious responsiveness to climate and the well-known threat of earthquakes (FIG. 1).[12] This architectural tradition, however, has always been dependent on a sufficient supply of timber. With locally sourced wood, its delicately balanced socio-geographical existence remained economically viable for centuries; but without such timber, the agrarian lifestyle of the local population could produce no other safe alternative. Deforestation by external contractors has now forced local people to build using stone or mud with little or no lateral bracing.[13] Thus, when the massive earthquake of 2005 struck, their structures fell instantly to the ground.[14] Most tragic was that children were attending their morning classes in schools, and the collapse was so sudden that they hardly had a chance to run outside.[15]

To prevent such a catastrophe from recurring, the local population needs a safe new building technology. Expensive concrete construction may provide one such alternative, but it is not affordable for local people, and obliges them to rely on external financial assistance. Repayment of loans can require years of labor away from home, thus disrupting family life and the local social fabric. Hence arises the question: Is it fair to promote financial dependency for these people — and thereby encourage the disintegration of their invaluable local culture?

The report begins with a brief description of the analytical perspective that frames the discussion and its relevance to the Balakot context. Within this conceptual frame, it then analyzes the uptake of safe, low-cost construction solutions encouraged by nongovernmental organizations (NGOs) as an alternative to the comparatively high-cost technologies promoted by the Pakistan government and international aid

DATES	LOCATIONS	INTENSITY	DESCRIPTIONS
893-894 AD	Debal (Lower Sindh)	Mw 7.5 (TS)	Nearly 150,000 people killed; towns destroyed in the region.
May 2, 1668	Near Shahbundar	M 7.6 (TS)	(Lower Sindh)
June 16, 1819	Allahbund	Mw 7.5	About 3,200 people killed; towns/villages destroyed in Kutchh.
September 26, 1827	Near Lahore (Punjab)	[n/a]	At least 1,000 people killed in Lahore and surroundings.
January 24, 1852	Near Kahan	[n/a]	250-350 people killed in the Kahan area, Muree Hills.
1865	Near Kahan	[n/a]	Several buildings destroyed (Balochistan).
1883	Jhalawan (Pakistan)	[n/a]	Reliable data not available.
1889	Jhalawan (Pakistan)	[n/a]	Reliable data not available.
December 20, 1892	Near Chaman	Mw 6.8	Reliable data not available.
October 20, 1909	Loralai/Sibi	Mw 7.0	Villages destroyed; more than 100 killed (Balochistan).
February 1, 1929	Buner/Hazara (KPK)	[n/a]	Reliable data not available.
August 27,1931	Mach (Balochistan)	Mw 7.0 (SSA)	Several people killed by falling masonry in Quetta.
May 30, 1935	Quetta (Balochistan)	Mw 8.1	Close to 30,000 people killed; city of Quetta was devastated.
November 21, 1939	Badakhshan Province	Ms6.9 (NOAA)	Reliable data not available.
November 27, 1945	Off the Makran coast	Mw 7.9	2.000 casualties in southern Pakistan and Iran.
August 5, 1947	Off the Makran coast	Mw 7.2	Reliable data not available (Balochistan).
December 28, 1974	NE of Malakhand	6.2Ms (NEIC)	5,000 fatalities.
September 12, 1981	Gilgit Wazarat (J&K)	6.2Mb (NEIC)	220 people killed, 2,500 injured in the Gilgit region.
December 30, 1983	Hindukush Mountains	Mw 7.4 (GS)	12 killed in the Kabul-Samangan area; 14 killed in Peshawar.
July 29, 1985	Hindukush Mountains	Mw 7.4 (GS)	5 killed in the districts of Chitral and Swat, Pakistan.
January 31, 1991	Hindukush Mountains	Mw 6.7 (NEIC)	300 killed in Konar, Nangarhar/ Badakhshan; 300 in Malakand.
August 9, 1993	Hindukush Mountains	Mw7.0 (NEIC)	Reliable data not available.
February 27, 1997	Near Harnai	Mw 7.3 (NEIC)	50 killed in the region of Quetta, Sibi and Harnai (Balochistan)
January 26, 2001	Bhachau (Gujarat)	Mw 7.6	11,500 killed in Gujarat; 20 killed in southern Pakistan.
November 20, 2002	Gilgit-Astore region	Mw 6.3	23 killed; 15,000 homeless (Pakistan-occupied Kashmir).
October 8, 2005	Balakot and Kashmir	M 7.8	70,000 people killed; approx. 3.3 million homeless.
October 29, 2008	Quetta (Balochistan)	M 6.4	216 casualties.
September 24, 2013	Awaran (Balochistan)	M 7.7	356 killed; 1.1 million homeless.

FIGURE 1. *Selected seismic records for Pakistan and adjoining regions. Data compiled from Disaster Relief by Irish and Pakistanis (DRIP) (2015), available at http://www.dripireland.org/earthquakeDetail.php?entid=18; and Pakistan Weather Portal (2015), available at http://pakistanweatherportal.com/2011/07/30/history-of-earthquakes-in-pakistan-in-detail/.*

agencies.[16] Particular attention is given to the Cal-Earth model, because it had received a prestigious international award for its affordability and constructability in the year preceding the earthquake.[17] Despite the construction of more than 500 demonstration units, there has been nil subsequent uptake of this alternative building model.[18]

The report's conclusions will include a critique of the communication strategies used until now to introduce this and other technological options to local people. One of its central recommendations is that a different approach to the introduction of safe and affordable alternative building technologies is needed if they are to be widely adopted in the future.

To underscore the social-justice aspect of this discussion, the report will combine the viewpoints of two theoretical approaches applicable to the larger field of disaster risk reduction (DRR) in Balakot. These are the concept of "spatial justice," as explained by Kurt Iveson based on the works of Peter Marcuse and Edward Soja, and the "capabilities approach," as applied to spatial decision-making by Andy Dong.[19] These theoretical frames will be combined here so that their commonalities may provide broad grounding for the analysis, and their variance may add depth.[20]

THE SPATIAL-JUSTICE AND CAPABILITIES APPROACHES AS A FRAME OF ANALYSIS

The spatial-justice and capabilities approaches offer readily applicable criteria for exposing the social-justice aspect of development work in general, and DRR efforts in disadvantaged communities in particular. Three of these criteria are especially useful to compare the range of spatial interventions in Balakot — namely, inclusion, capacity and proaction. The relevance of these criteria and their application to both ongoing investments and possible future alternatives will be described below and in three accompanying text boxes.

The inclusion of disadvantaged communities in decision-making is a foundational element of both the spatial-justice and capabilities approaches. For example, Iveson noted that "public participation" is a primary manifestation of spatial justice, while Dong has cited U.N. policy statements to invoke the "freedom" of people to form their own spaces.[21] Taken together, these views offer a robust critique of how interveners remain the decision-makers in Balakot, while the local people have been consigned to the receiving end, having to resort to protests to express their views.[22] This power imbalance, as perpetrated by donor agencies, government institutions, and NGOs alike, is itself a breach of the principle of social justice, and its repercussions only worsen that condition.

Four visible manifestations of a lack of concern for inclusion in the Balakot context are discussed in the first accompanying text box (FIG.2). They are nonparticipatory decision-making, lack of consideration for affordability, disregard for socioeconomic risk, and inattentiveness to alternatives.

Nonparticipatory Decision-Making. In conditions marked by an unequal distribution of power, increased care is needed to maintain the sense of ownership needed to ensure long-term adoption of safety measures by local people.[23] In Balakot, however, mainstream government-sponsored construction-technology decision-making has yet to include mechanisms to elicit villagers' opinions. This may be the reason why only limited consideration was given to the availability of materials in the options offered via the otherwise-advanced program of "owner-driven reconstruction."[24] Media-driven localized institutionalization of participatory processes has been tested elsewhere in Pakistan, but the lack of investment in the development of effective strategies for tackling low levels of literacy has constrained further replication.[25] Future strategies also appear to include only elementary provisions for citizen engagement, as visible in the as-yet "steadily expanding" usage of the community-based approach.[26]

Lack of Consideration for Affordability. A resulting imminent issue is that interventions by government institutions and donor agencies have still not been able to introduce viable long-term alternative technologies, and are instead directed mostly toward expensive immediate solutions.[27] Whereas the quality of some earthquake-resistant construction is commendable, its material costs and skilled-labor requirements foretell increasing dependence on external aid for further replication.[28] High-profile giveaway solutions serve well as one-off, short-term indicators of the performance of the government and international donors, but they are at odds with local economic realities.[29] They also fail to accord with the rudimentary construction skills of the villagers.[30] Therefore, these solutions offer only marginal potential for sustainability of investment.

Disregard for Socioeconomic Risk. Offering expensive DRR solutions to disadvantaged communities is typical of a neoliberal approach to intervention. Typically, this may claim long-term benefit based solely on the assumption that creating a new high-quality built environment will itself provide a stimulus for the socioeconomic development required to sustain it.[31] Such an approach also assumes that if people pursue expensive construction on the basis of financing, this will create demand for future production. An increase in construction activity is likewise considered a sign of economic growth and a source for employment, thereby contributing to poverty alleviation.[32] This rationale, however, downplays the risk that if socioeconomic dynamics operate differently than expected, financing-based physical construction will produce stress-creating debt rather than a productive asset for the people.[33]

Inattentiveness to Alternatives. Alternatives are rarely considered. For example, one option would be to consider the limited financial and technical resources of the population and "incentivize" rural inhabitants to themselves carry introduced technological systems into the future and across the landscape.[34] This approach might reduce the financial burden for villagers. But it has only been explored in Balakot as an add-on rather than a mainstream feature of DRR initiatives by the government and aid agencies.[35] A number of NGOs have pursued this approach, and have invested extensively in alternatives.[36] These efforts can best be appreciated by taking into account the criterion of capacity adopted as part of the dual-analytical framework of this report.

FIGURE 2. *Manifestations of the socially unjust approach used by government and foreign-aid agencies in Balakot.*

Capacity is the second important concept used in the analytical framework adopted by this report. Dong has identified the ability of a given population to exercise control over its built environment as a central issue in the context of rebuilding in the wake of a disaster.[37] Iveson has also highlighted capacity, albeit with reference to community action to "both conceptualize and organize," as crucial for addressing the deeper, systemic roots of injustice.[38]

Combining these slightly varied conceptualizations means understanding that respect for social justice implies acknowledging the preexisting disadvantages affecting a given community. In the case of Balakot this means taking into account the complete physical, socioeconomic, governance and cultural context of spatial production in Pakistan's Northern Areas. For example, to comprehend the discontinuation of traditional timber-based earthquake-resistant construction, it is necessary to consider how political decisions led to the deforestation of the area over the last century and a half.[39] Similarly, it is imperative to take into account how concern for aesthetic values may be involved in the continued use of the very post-and-lintel or stone construction techniques that caused great loss of life in the 2005 earthquake.[40]

Altogether, awareness of five core contextual factors may be indispensable to planning an effective intervention in the Balakot context: indigenous construction skills; availability of materials in the aftermath of deforestation; absence of a convergence of motives; acculturation as the combined effect of colonialism, expatriate income, and tourism; and limited affordability due to socioeconomic underdevelopment. A discussion of these factors is provided in the second accompanying text box (FIG.3).

Indigenous Construction Skills. Technical analysis suggests that it was not the earthquake that caused the great loss of life and property in 2005, but rather structural failure of buildings. This conclusion was evident in numerous excerpts from relevant literature:

> Pakistani census data had 788,000 homes registered in the area. The earthquake destroyed at least 400,000 homes, . . . and left many thousands more uninhabitable.[41]

> [The] vulnerability of rural housing was attributed to non-use of seismic-resistant principles in construction, [and] low quality materials. . . .[42]

> [T]he region had not been affected by an earthquake directly over the past few decades . . . [and] communities were caught unprepared for such a devastating disaster.[43]

> [Where] half-dressed masonry structures [predominate] . . . [u]p to 40 percent of building stock can collapse in large earthquakes. . . ."[44]

> In the 2005 Kashmir earthquake (M 7.6), over 74,000 people died in Pakistan, most of them buried under the rubble of traditional stone masonry dwellings.[45]

> [B]uilding damage was the main cause behind the human and property loss. . . . [The] collapse of structures . . . [was facilitated by] a lack of incorporation of seismically resistant features.[46]

> [As a result of] un-reinforced stone masonry . . . [and] poor quality of material and workmanship . . . people remained trapped under the rubble of stones, mud and . . . slabs.[47]

> Noncompliance with seismic provisions in the building design . . . [and] lack of quality control in construction . . . [were] dominant factors in causing . . . numerous casualties.[48]

> A significant number of casualties and injuries in the affected region was associated with the complete collapse of single story unreinforced stone masonry buildings.[49]

> [The earthquake] demonstrate[d] the poor performance of both engineered (largely RC [reinforced concrete] structures) and non-engineered (URM [unreinforced masonry] and some low rise RC) structures. . . .[50]

> [The] 2005 earthquake . . . increased the probability of . . . possible repetition. . . . [The] death toll in such an event would probably be even larger. . . .[51]

These observations suggest that Balakot's population lacked both the knowledge and skill to construct a safe built environment. But this immediately raises an important question: If there is a long history of seismic activity in the region (as evident from the historical data given in Figure 1), why is this not reflected in vernacular construction practices? In other parts of the Northern Areas, such as Kashmir and Hunza, traditional construction practices involving the use of timber bracing can still be seen in surviving structures of past generations.[52] Why were these time-tested successful solutions not in practice at Balakot?

Availability of Materials in the Aftermath of Deforestation. A direct cause for the discontinuation of traditional safe building practices has been a decrease in the availability of materials.[53] The commercially motivated deforestation in the 1960s and 1970s of Chitral, a valley in the same mountain region, was discussed at length in a series of International Hindukush Cultural Conferences.[54] And the resulting depletion of timber supplies, as well as the escalation of timber prices due to scarcity, has been attributed to political decisions related to the Northern Areas in Pakistan in general.[55] When considered in conjunction with other potential reasons given below, this offers a possible explanation for the lack of resistive timber framing in vernacular construction in Balakot.

Absence of a Convergence of Motives. Balakot has historically never served as a seat of political power, as have other nearby parts of the Northern Areas, where buildings constructed with traditional timber-based techniques may still be seen.[56] It may, however, be reasonable to assume that one of the factors contributing to the development of elaborate timber-based construction (e.g., approximately two to ten centuries ago in Kashmir and Hunza) was the patronage of rulers who demanded the symbolic or monumental structures that survive to this day.[57] Eventually, Balakot also began to enjoy attention, but more as a tourism hub and not until a half century ago — and then perhaps only on account of the development of modern transportation options.[58] It is plausible, therefore, that the new forms of settlement that have emerged since then may not incorporate communal memory of earlier major seismic events in the region. Hence, a strong collective motivation to pursue seismic-resistant modes of building may not have developed in Balakot — as has been the case in the Chitral valley, where some structures have been inhabited for more than five centuries.[59]

Acculturation as the Combined Effect of Colonialism, Expatriate Income, and Tourism. In Balakot and immediately surrounding communities, among those who can afford to build in a material other than stone there is an observable aesthetic preference for cement and brick construction.[60] This preference is apparently related to influences originating beyond the built-environment traditions of the Northern Areas. Some of these may be traced to colonial-period impacts, but others may come as the result of the more recent proliferation of the electronic mass media.[61] These factors can be categorized as international-level developments, not only in the realm of politics and electronic technology but also as related to economic changes. This last development is particularly manifest in Balakot's reliance on expatriate income remittances from men working for long periods in other cities or countries — a condition typically accompanied by another whole set of cultural influences and adaptations.[62] Similarly, an influx of tourists to the region has generated visual and aesthetic demands, as the default outcome of catering to the expectations of foreign visitors in order to attract and consolidate their patronage.[63] Together, these cultural factors must be considered part of the context which led to an absence in Balakot of the timber-based traditional safe building practices known regionally as *dajji-dewari* and *taq* techniques.[64]

Limited Affordability due to Socioeconomic Underdevelopment. A preference for brick or cement construction may be externally inspired, but both materials may still produce the same basic, rectilinear visual character found in traditional timber-based construction. However, to maintain this preference while pursuing earthquake-resistance without timber almost invariably translates into the use of steel reinforcement.[65] This can escalate the cost of building by up to 100 percent — whether the steel is used as part of a systemic shift to reinforced-cement construction, or simply added in the form of horizontal and vertical bracing.[66] Such practices imply the need for additional financial resources in a region that on the whole remains socioeconomically underdeveloped.[67] And if, due to its cost, people compromise on the amount of steel needed, this will by default translate into vulnerable building practices.[68]

FIGURE 3. *Factors affecting construction technology decisions in Balakot.*

Combined, these socio-cultural, economic, and governance-related factors form the context in which the people of Balakot have made decisions with regard to safe building practices. They also provide the background for peoples' perception and responses to the agenda of disaster risk reduction (DRR) there. And it is in this context that staff members of a prominent locally based NGO have noted that many local people are still using unsafe building practices despite the elaborate investments to introduce safety concepts.[69] This discrepancy demands a response, and in turn leads to the third critical criterion: proaction.

Both the capabilities approach and the spatial-justice concept extend beyond merely reacting to specific forms or effects of injustice. Indeed, they suggest that steps be taken proactively to instill mechanisms inducive to social justice at a deeper, causative level.

Iveson recalled Marcuse and Soja to highlight the concept of proaction in general. Although the urban context for his discussion of the Green Ban movement of Sydney is completely different from the Balakot situation, it nonetheless provides as an example underscoring the highly relevant global dynamic at work:

> *[I]f we can read the Green Ban movement as an example of Soja's "spatial justice" approach in action, so too we can recognize Marcuse's concept of the right to the city in the movement's explicit concern with wider capitalist processes of urbanization.*[70]

The capabilities approach likewise supports this invocation for proaction, and deepens it by providing a defined direction. Thus Dong specifically suggested that interventions for disadvantaged communities be aimed at "developing their capability."[71]

These conceptualizations of proaction may be translated to the context of Balakot through three specific cultural objectives: socio-political sustainability; physical-environmental sustainability; and an ethical approach to intervention. These objectives are briefly explained in the third accompanying text box (FIG. 4).

The criteria of inclusion, capacity and proaction, as extracted from the capabilities and spatial-justice approaches and fleshed out in the accompanying text boxes, provide a social-justice framework that will next be used to conduct an analytical review of building-technology interventions in Balakot since the 2005 earthquake. This will begin with a brief description of interventions sponsored by the Pakistan government and international aid agencies, followed by an examination of those conducted by local NGOs. Various characteristics of each type of intervention will be discussed with reference to the relevant analytical criteria.

Socio-Political Sustainability. Although World Bank guidelines for disaster recovery were issued five years after the earthquake-relief efforts began in Pakistan 2005–6, they still sought to redress asymmetric decision-making modes with suggestions such as "A good reconstruction strategy engages communities and helps people work together to rebuild.[72] World Bank guidelines further recommend that a "strong commitment and leadership from the top are needed to implement a bottom-up approach, because pressure is strong in an emergency to provide rapid, top-down, autocratic solutions."[73] This is a policy-level manifestation of the concept of proaction in implementing social justice. It implies that interventions can produce socio-politically sustainable outcomes when power relations are used in a concerted effort to include disadvantaged stakeholders.

Physical-Environmental Sustainability. Another strategy for social-justice proaction is to ensure that interventions are designed to avoid creating undue burdens on already-scarce local resources. This concept was visible in an environmental sustainability implementation package developed by U.N.-Habitat in 2011.[74] A particularly illustrative aspect was how this document addressed the use of fuel for heating in cold weather and the need for efficient insulation alternatives. This included activities aimed at exploring options: community consultation; diagnosis of performance; identification of local and external best practices; development and testing of options; training; demonstration; and, public awareness.[75] The package provided a model devolution-oriented intervention.

Ethical Approach to Intervention. A pan-ultimate ethical consideration that has been highlighted in recent comprehensive reviews of international DRR initiatives is the transfer of power from the benefactors to the beneficiaries. This issue was expressed succinctly by Ahmed:

> [I]t is also necessary to develop local capacity so that the technical "know-how" remains in the area and benefits the wider community beyond project beneficiaries and is replicated beyond project confines.[76]

Application of this concern in Balakot should translate into interventions that may be designed back out of the context, thereby fostering independence rather than dependence. An illustrative example, albeit in a diagonally opposite sense, is the engineering-wise sustainable but socioeconomically risk-creating approach of the government-channeled response to an earthquake in Bam, Iran, in 2003.[77] Government-sponsored reconstruction intervention in Bam was claimed to be participatory because the affected people were first shown a range of model houses and were then assisted in constructing their own houses according to the design they preferred.[78] However, it is evident from the range of model houses offered that the technological choices recommended to the people were based on a vision of high-quality construction with little consideration for the cost of replication independent of government support.[79] Though the people may wish to replicate the introduced technology, this may perhaps only be possible at the cost of perpetual dependency.

FIGURE 4. *Proaction targets for the Balakot context.*

COMPARISON OF DRR INTERVENTIONS IN BALAKOT

The following comparison of interventions is primarily intended to help discern their social-justice effects, and thereby improve the quality of future projects. For this reason it will not provide a full documentation of all interventions. Rather, a few selected interventions will be examined to highlight two basic levels at which social justice may be addressed.

The first level of social-justice concern is immediate relief. Actions within this sphere alleviate injustice in a given community by providing a short but quantitative burst of material support. Such actions may deliberately compromise planning for subsequent needs, however, and therefore run the risk of creating a cycle of continued assistance, or dependence. Iveson cited work by Marcuse and Soja to classify such actions as addressing injustice merely at the level of "form."[80] Dong has critiqued superficial efforts to include the views of local people about such interventions as "bean counting."[81]

The second level of concern for social justice involves targeting the sources of injustice — in other words, engaging in systemic reform. Dong has pointed to "the question of who can impose order" to highlight the significance of confronting inequality at the causative level.[82] Iveson has referred to this as targeting what Marcuse and Soja have described as the "process" of injustice.[83]

In DRR interventions, one possible manifestation of attempts to address issues of social justice at both levels — that is, as cause and effect — may be to foster independence instead of dependence. Against the backdrop of the analytical perspective formulated in the first part of this report, this is the point that the ensuing comparison will seek to elucidate.

Among all the interventions in Balakot since the 2005 earthquake, the largest by far has been coordinated by the government-sponsored Earthquake Reconstruction and Rehabilitation Authority (ERRA). This organization was established to address both the short- and long-term needs of the affected people.[84] So far its projects have benefitted from approximately US$1 billion in funding from a number of foreign countries, as well as funding and consultation services from the United Nations and the World Bank.[85] However, its initial approach was criticized in various reports as "over-centralized" and insensitive to issues of sustainability and affordability.[86] In terms of the social-justice criterion of capacity described in the last section, ERRA's initial policy to approve only "construction techniques that applied cement and steel" also appears fundamentally at odds, in light of prevailing local construction skills and socioeconomic conditions, with the objective of promoting independence.[87] Images of houses and schools built under this approach are available on the ERRA website (www.erra.pk), and several are provided here for reference (FIG.5). Though this approach was later modified to include local timber-based construction techniques, this social-justice adjustment has remained an added layer, rather than a mainstream approach.[88]

No doubt, ERRA has delivered state-of-the-art technology for reconstruction in the Balakot region. But its indifference toward the future capacity of the local people to provide for their own needs may perpetuate dependence on external assistance. The approach thus clashes with the concept of long-term socio-cultural sustainability; indeed, it symbolizes a form of concern for social justice that is devoid of long-term vision. Such interventions may thus be counted as simply a reaction to catastrophe, rather than a form of proaction aimed at establishing positive impacts beyond immediate relief.

One clearly positive achievement of the ERRA program has been an inclusive mode of implementation. Affected people were called on to implement their own decisions regarding reconstruction of their homes, with the only condition for government funding being to have the construction checked at each stage by appointed teams before funds would be released for subsequent stages.[89] This method has been acknowledged in published work as "one of the most success-

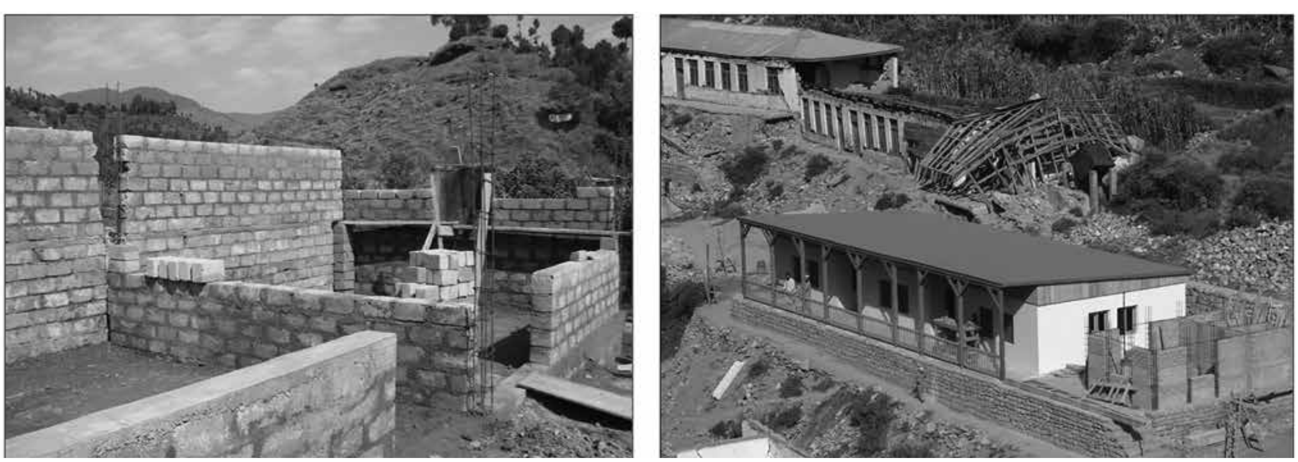

FIGURE 5. *Images from ERRA's website, showing cement and steel structures.*

FIGURE 6. *TCF schools use an imported prefabrication technology.*

ful examples of owner-driven reconstruction."[90] However, the question remains whether a lack of concern for long-term sustainability — in particular, reliance on high-cost, preset technology options — may make a mockery of this exercise in local autonomy instead of encouraging peoples' "right" to spatial sovereignty.[91]

A similar approach has been visible in the work of The Citizens Foundation (TCF). Although this is a nongovernmental organization, its projects in the region likewise employ locally nonreplicable technologies. An estimated 1,000 school buildings have been constructed by TCF in Pakistan, of which approximately 10 percent are located in the Northern Areas.[92] However, many of these have been constructed with prefabricated technologies that cannot be replicated in a primarily nonindustrial region.[93] Images of completed buildings may be found on the TCF website, http://www.tcf.org.pk, and several are provided here for reference **(FIG.6)**. Though TCF's continuing initiative is a par-excellence example of addressing the immediate disadvantage of a community by providing international-quality facilities for children, it has yet to address the risk of socioeconomic dependency embedded in the use of nonlocal construction technologies. This creates the same problem as the ERRA approach. It also contrasts to the work of other NGOs that have sought to intervene in ways that foster independence.

Foremost among the NGOs that have taken the latter approach is the Heritage Foundation of Pakistan (HF). According to its 2011 report, HF completed 1,200 houses for affected people after the 2005 earthquake. And, in an attempt to indigenize the technology introduced as much as possible, it later further refined its design and technology package to include a bamboo-based solution.[94] By the end of 2011, as part of its Green Karavan Ghar project, it had built 266 houses using this package, each consisting of a covered area of approximately 30 square meters, at a typical cost of 50,000 Pakistan rupees (at current conversion rates, approximately US$500).[95] Images of units are displayed on the HF website, http://www.heritagefoundationpak.org/, and several are provided here for reference **(FIG.7)**.

In contrast to the indifference to replication reflected in the ERRA and TCF projects, the HF approach is an example of a long-term sustainability vision. It matches to a commendable extent the estimated US$750 average annual per-capita income of residents of the Northern Areas. Ap-

FIGURE 7. *HF's bamboo-based technology-design package.*

proximately 34 percent of this population is classifiable as living below the internationally defined poverty line; the income level in the area is estimated to be 40–58 percent of the general level in Pakistan level; and the per-capita level of income in Pakistan as a whole is estimated to be a little more than US$1500.[96]

By showing concern for affordability (and in turn long-term sustainability), the HF vision is consistent with the process, or causative-level conceptualization, of social justice. However, it must also be noted that, according to a 2011 report, the units built have been fully subsidized by HF via its financial sponsors, and therefore the intervention has yet to include a reliable indicator of the actual uptake of the technology by local people.[97] This has been a critical shortcoming for another intervention, the award-winning Cal-Earth model, which will be discussed in the next section.

CAL-EARTH IMPLEMENTATION IN BALAKOT

The late architect Nadir Khalili received an Aga Khan Award for Architecture in 2004 for an alternative shelter solution with application specifically to the context of developing societies.[98] Distinguishing features of this building system include its ability to resist seismic forces based on a curvilinear instead of rectilinear form, its maximum use of on-site materials, its relatively low-tech method of assembly, its aesthetic approach to integration with natural surroundings, and its monolithic consolidation of roof and wall components (as opposed to typical building systems where separate components are brought together at joints).[99] Essentially, the system comprises earth-filled sandbags stacked to form a circular enclosure that converges gradually at the top to form an igloo-like structure.[100] It can potentially satisfy immediate as well as permanent needs — as an emergency shelter or a low-cost, long-term housing option.[101]

The building system was named after the Cal-Earth Institute in California, founded by Khalili, and is also known as superadobe or eco-dome due to its use of earth.[102] Since the crucial need after the 2005 catastrophe in Pakistan happened to match almost exactly the features offered by this model, it was logical to assume that it could serve as a relevant solution. That is why the military as well as philanthropic organizations involved in relief work actively supported its implementation in Balakot and the adjoining region at that time.

According to the Cal-Earth Institute, queries began pouring in soon after the Balakot earthquake as to whether this model could provide emergency shelter for an estimated 2.5 million internally displaced people who required immediate protection from severe winter conditions and possible aftershocks.[103] And in the weeks that followed, trained graduates were assigned to offer a master-training workshop in Pakistan to teach the technique to military personnel and selected skilled laborers in the Balakot area.[104] A brief documentation of this implementation is available on Cal-Earth's website, www.calearth.org (FIG. 8).

After the master-training sessions were held in Islamabad, teams of military personnel and construction workers went into villages and recruited local masons as well as lay people to join them in the implementation.[105] An estimated 500 units, each of 3–5 meters diameter, were then built in late 2005 and early 2006 to provide immediate relief and hands-on training for local people so they could continue the effort on their own.[106]

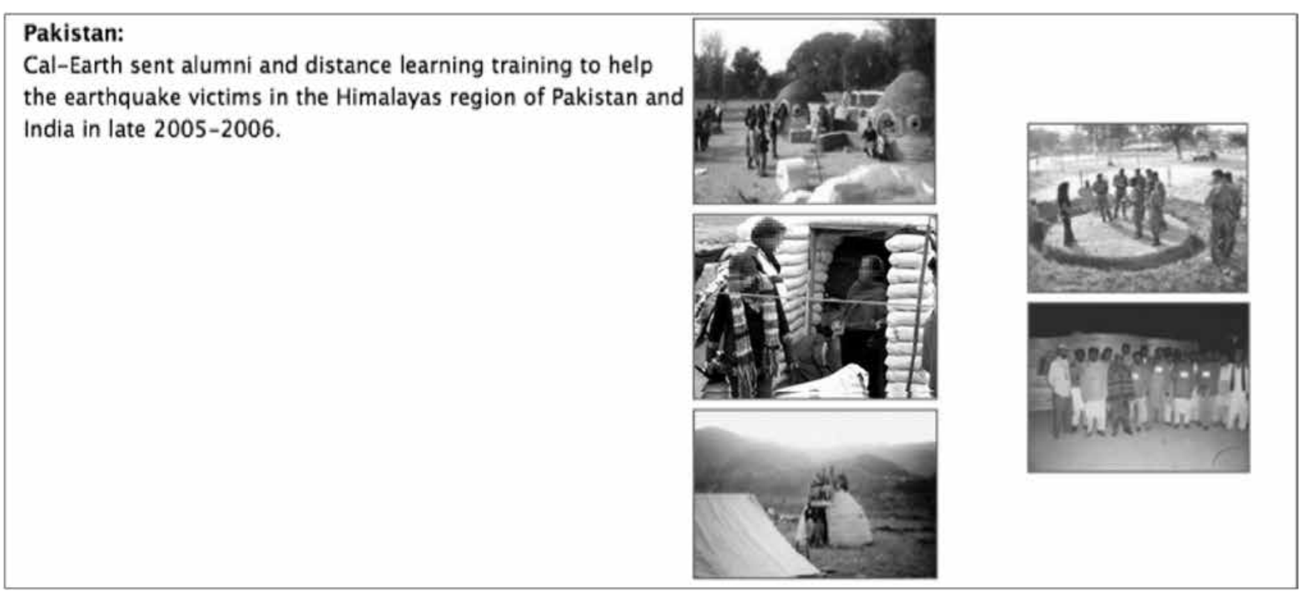

FIGURE 8. *Cal-Earth image showing Pakistan implementation.*

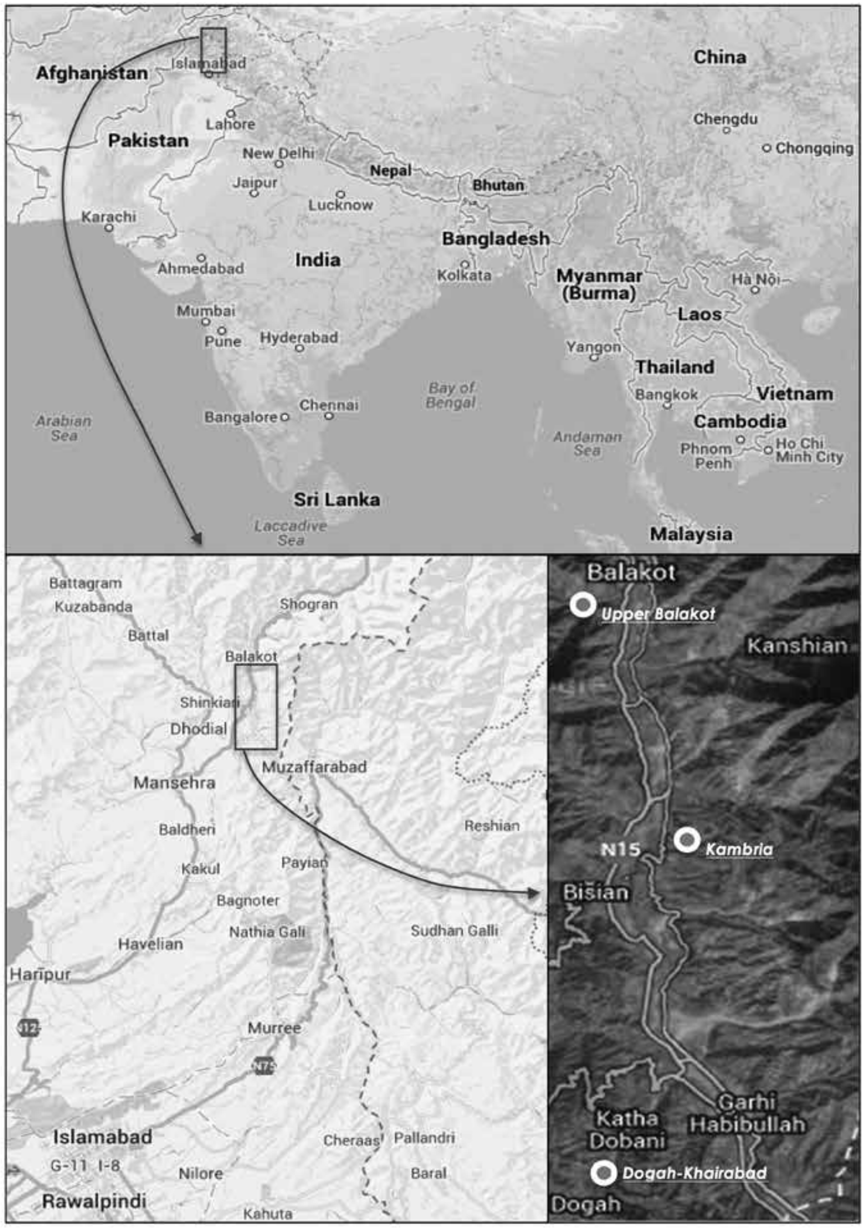

FIGURE 9. *Villages visited. Modified Google Maps screenshots.*

To assess the success, or lack of it, of this effort the first author of this report traveled to the area during 2009 and 2011. His research involved meeting individuals who were part of the organizations involved as well as a few of the beneficiary-owners.[107] The total area affected by the earthquake has been estimated to be approximately 3,000 square kilometers. Some of the original units were reported to still be intact within this area at the time of these visits. Some of these structures were located in two villages: Kambria and Doga-Khairabad (**FIG.9**). Even though it had been five to seven years since they had been built, it was still possible to obtain useful reflections about the initial implementation and present status of this building effort.

To begin, it should be noted that the Cal-Earth model relies primarily on a dome or igloo shape because such homogenous structures are more able to resist seismic or other deformation.[108] Indeed, because it largely eliminates joints in foundations, walls and roofing, a hemispherical dome-like structure can theoretically be considered an ideal passive-resistance form.[109] This reason, combined with the prospect of minimization of construction labor, is why several concepts based on curvilinear forms were considered at the time of Balakot relief work — as evident from other dome-shaped structures still present in the area (**FIG.10**).

Interestingly, in a nearby village, Garhi Dupatta, in Azad Jammu and Kashmir, a U.S.A.-based NGO called OMEED

FIGURE 10. *Experimental geodesic dome in Balakot. Photo by Mohammad Ashraf Khan.*

FIGURE 11. *Vocational Institute at Garhi Dupatta near Balakot, built using Cal-Earth technology. Images downloaded from FaceBook with OMEED's permission.*

(http://omeed.org), successfully constructed a vocational school building using the curvilinear Cal-Earth technology in 2007 **(FIG.11)**. However, people involved in the implementation process in Balakot and its surroundings during 2005–06 said villagers were averse to curvilinear-shaped dwellings from the outset.[110] This was an unexpected reaction considering that such forms are not unprecedented on the India-Pakistan subcontinent. And though villages in Pakistan are mainly constructed of rectilinear dwellings, villagers in some subregions actually prefer curvilinear forms — though not necessarily for earthquake-safety reasons.[111] Images are available on websites that document examples, such as Cholistan desert homes in southeast Pakistan **(FIG.12)**.[112] The existence of such negative feelings toward the roundness of the Cal-Earth superadobe technology among the people of Balakot, however, begs the question of whether any uptake of the technology had occurred in the area at all. This was the impetus behind visits to collect observations from actual sites, as described below.

The local office of a provincial government rural development organization, the Sarhad Development Organization, indicated that Kambria was the nearest village where intact units would most likely still be found.[113] According to one of the villagers there, a total of eight units had originally been constructed, of which the first author visited three **(FIG.13)**. The villager expressed praise for the concept and said that local people might have built more if the supply of nonlocal donated materials, such as woven polypropylene bags and barbed wire, had not run out.[114] At all the visited units, however, the part of the dome above wall-height had subsequently been replaced by galvanized-metal-sheeting, and the units were being used either as storage space, playrooms for children, or animal sheds for winter.

FIGURE 12. *Cholistan round-shaped mud houses with thatch roofs.*

After Kambria the author visited the village of Doga-Khairabad, where a number of partially intact units were also found. Here as well the portions of the structures above wall height had been replaced with either galvanized-metal sheets or mud-thatch roofing (FIG.14). In addition, one of the structures was found in a partially collapsed condition, offering clues for analysis as to the causes of its failure (FIG.15).

Though a full-fledged technical analysis is beyond present discussion, a few elementary observations can be made about the fate of this structure in light of the detailed guidelines and demonstration videos available on the Cal-Earth website.[115] In particular, four key observations were made after inspection of the partially collapsed unit (marked in numbers on the image).

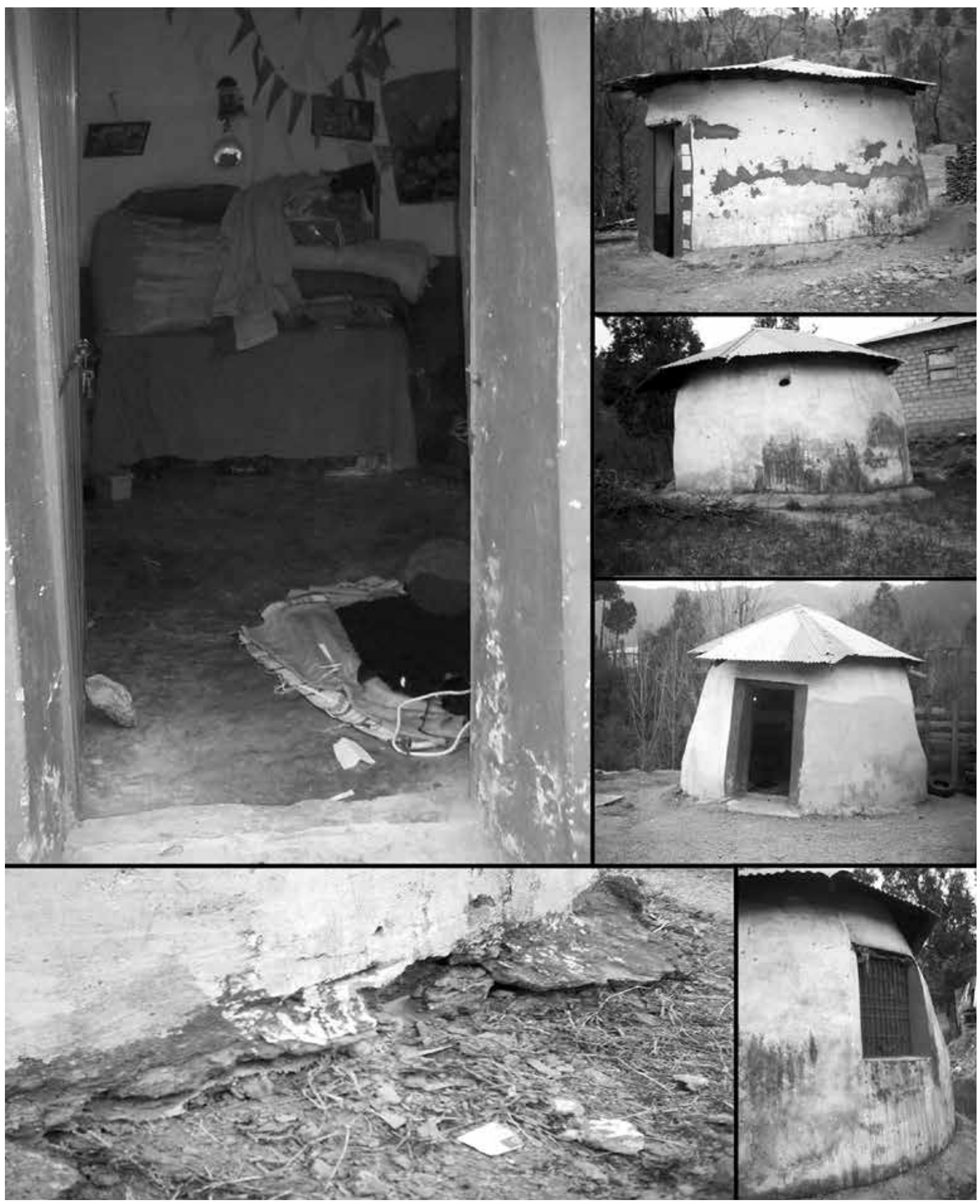

FIGURE 13. *Image/ details of partially intact units at Kambria. Photos by Mohammad Ashraf Khan.*

FIGURE 14. *Images of partially intact units found in Dogah-Khairabad. Photos by Mohammad Ashraf Khan.*

FIGURE 15. *Partially collapsed unit found in Dogah-Khairabad. Photos by Mohammad Ashraf Khan.*

The first apparent cause for the structure's failure was land-slip, marked as (1) on the image. This refers to the collapse of the ground at the base of the unit — which had most probably softened after a heavy or continuous downpour, and was no longer able to support the weight of the structure. It is further possible, however, that this particular structure was built too close to the edge of an adjoining slope, and that the cement skirt at its base had not been wide enough to prevent the immediately surrounding ground from becoming wet.

Second, there was a distinct vulnerability at openings, marked as (2) on the image. Although the sandbags can be seen to have slipped and emptied just above the sloping edge side, some of the lower layers of the bags are still in position. This indicates that there may have been an opening at that place. Whereas one edge of the opening may not have collapsed, the other edge may have failed due to greater lateral forces caused by its position at the lowest point of the slanted position of the structure. This observation is also linked to the closed ends of the sandbags visible at the edge that remains intact; these indicate that there was a closure in the sandbag rings at that point, as required for creating an opening. On the opposite side of the structure, a similar observation can be made, but this time extending all the way from the base to the top edge, indicating the presence of a doorway (the other edge of this opening can be seen collapsed inwardly).

A third observation is the absence of barbed wire. It is critical to note that, along with the portions of the emptied rows that can be seen at the lowered side of the structure, corresponding lengths of barbed wire should have been visible hanging outwards at the point marked (3) on the image. Their absence suggests one of three possibilities: either no barbed wire was used at all in the structure; or the barbed wire was cut short at the edge and did not reach all the way to where the sandbag rows had terminated; or the barbed wire had been cut when it was exposed — suggesting that it had been unable to prevent the slipping of the sandbags when the lateral force due to the angle of incline of the structure exceeded the friction between the sandbag layers.

Fourth is an important visual cue: the vertical line on the exterior. A vertical line can be seen on the outer surface near the edge of the ground failure at the place marked (4). This could be due to the presence of a steel rod, in which case the vertical element that can be seen in the interior in approximate alignment may also be a steel rod, with the two rods placed on either side and perhaps tied from the top to provide extra bracing against a possible risk of failure — either anticipated at the outset or during an initial stage of the landslip.

Finally, there is a discrepancy in the tapering angle. The wall inclination is close to vertical at the point marked (5). This indicates that the rows of sandbags were not stacked at the required angle to maintain the stability of the structure.

Overall, these observations indicate either a lack of proper understanding of the concept on the part of the construction team or hasty workmanship due to the emergency nature of the situation when this structure was built after the 2005 earthquake.[116]

INFERENCES AND RECOMMENDATIONS: NEED FOR A COMMUNICATIONS APPROACH

While the ERRA and TCF interventions stand out as international-level accomplishments, they pose the risk of creating a condition of dependence among the local population on outside sources funding. On the other hand, although the HF and Cal-Earth interventions addressed the social-justice parameters of capacity and proaction at the systemic level, neither has yet to demonstrate independent uptake. The accompanying table presents a summary of these inferences for each of the interventions documented here with respect to the social-justice indices that have informed this report (FIG.16).

A critical point to note is that observations of the remaining Cal-Earth units indicate that discrepancies of application may have been present during construction. This prompts the authors to theorize that outcomes may have been different had the implementation process been handled with greater rigor. This finding bears within it three deeper inferences. First, implementation procedures need to be made part and parcel of the design process from the outset of any superadobe build, especially in Pakistan. Second, implementation should, in fact, be considered part of the theory of superadobe, reflecting its enactment as a concept. And third, in light of the above two concerns, a strong participatory approach should be considered essential to the implementation of superadobe technology within disadvantaged communities. These insights are briefly expanded upon in the following discussion of possible future applications of low-cost alternative technologies such as the Cal-Earth system.

Based on the preceding brief review of interventions in Balakot, it would seem that any intervention aimed at delivering social justice within a disadvantaged community can work only when both its main components (intent and execution) are in synchrony. With regard to DRR work, this means that a construction technology that is safe yet affordable as well as easy to construct can have immense benefit only if it is introduced in a manner that attracts uptake. Vice versa, it matters little if the process of execution is impeccable for a technology whose local sustainability is questionable due to economic or technological restrictions.

Both Iveson and Dong confronted this dichotomous correlation at its generic level, but with slight variations of approach. On the one hand, Iveson engaged these two intervention components when he observed that "agendas for justice are incredibly difficult to enact."[117] On the other, Dong first discussed the component of "framing public policy toward . . . capability," and then elaborated on its implementation under the heading "Actions toward capability development."[118] This dual-component conceptualization of social-justice delivery

Interventions	**Social Justice Indices**			**Overall**
	Inclusion	Capacities	Proactive Approach	
ERRA 	• choice of options • fully subsidized construction	• no consideration for affordability • marginal consideration for constructability	• funded by UNO and other agencies • incremental reimbursements	• contributing to the creation of dependency via high-cost solutions
TCF 	• no options • no participation	• no consideration for affordability • no consideration for constructability	• proactive mobilization • average family income assessments	• contributing to the creation of dependency via high-cost solutions
HF 	• choice of options • hands-on participation	• excellent consideration for affordability and constructability • no self-help	• no uptake indicators	• contributing to the creation of independency via low-cost solutions
Cal-Earth 	• no choice of options • hands-on participation • no interface	• excellent consideration for affordability • medium consideration for constructability	• funded by private donors • sponsored by military	• contributing to the creation of independency via low-cost solutions
	absence of interface for communications	absence of a self-help approach	lack of reliable uptake indicators	

FIGURE 16. *Matrix of interventions vs. their social-justice content.*

offers a possible answer to the question raised at the outset of this report: Why has there been close to nil uptake of the award-winning Cal-Earth model despite its widespread demonstration via the construction of more than 500 units?

It is further intriguing to reflect on the response of the people towards the Cal-Earth superadobe option in light of the comments of the international jury of experts that acknowledged it. In part, the text of the award citation read:

> *These shelters serve as a prototype . . . using extremely inexpensive means to provide safe homes that can be built quickly and have the high insulation values. . . . Their curved form was devised in response to seismic conditions, ingeniously using sand or earth as raw materials, . . . their flexibility allows the construction of single- and double-curvature compression shells that can withstand lateral seismic forces. . . . [The system provides a symbiosis of tradition and technology . . . [and] vernacular forms, . . . {and it offers a remarkable degree of strength and durability. . . . [T]he structures are not external systems applied to a territory, but instead grow out of their context, recycling available resources for the provision of housing.*
>
> *The sustainability of this approach is further strengthened because the construction of the sandbag shelters does not require external intervention but can be built by the occupants themselves with minimal training. The system is also highly flexible . . . [and] can be varied . . . for different numbers of individuals or groups with differing social needs. Due to their strength, the shelters can also be made into permanent housing, transforming the outcome of natural disasters into new opportunities.*[119]

Incidentally, the technical discrepancies of the half-collapsed unit documented above indicate that anomalies in the implementation, or enactment, of the Cal-Earth building system may possibly be the main cause for its lack of uptake; therefore, the agenda or policy behind its application in this instance may still be valid, if applied with full integrity. Consistent with this observation, some other gaps related to socio-cultural and communications aspects may also be observed, especially when this particular case of implementation is gauged against other internationally acclaimed instances of its use.

Implementation of a new building technology in general, especially in a wider international context, and specifically when it requires a sizable self-help input from a disadvantaged community, is inseparable from the need to develop a sense of ownership. In hindsight, this was an ambiguous aspect of the Cal-Earth intervention in the Balakot region. Little or no attention was paid to developing a sense of ownership among the beneficiaries, even though it is a standard requirement today for all forms of construction assistance in disadvantaged communities.[120] For example, this requisite underpins the community-mobilization approach in the Northern Areas of the popular Aga Khan Rural Support Program (www.akrsp.org.pk/). Indeed, it is precisely this quality that earned this initiative international recognition via the United Nations Environment Program Global 500 Award and the Ashden Award.[121] Indeed, it is likely the Cal-Earth initiative could have been far more successful following the 2005 earthquake had its implementation been based on the owner-driven, incremental-development paradigm recommended by U.N.-Habitat and the World Bank, and as successfully deployed by ERRA.[122]

A second noticeable gap would seem to involve socio-cultural appropriateness. One of the villagers, when asked why he disapproved of the curvilinear form of superadobe structures, said he found it difficult to adjust his cot to the round walls of the dwelling.[123] In other words, it may have been beneficial to gather general feedback from local people to understand the socio-cultural implications of the technology before attempting to introduce it on a wide scale in the region. If this had been done, an architectural or interior-design solution could have been included with the technology to address the problem of reconciling rectilinear furniture to a curvilinear space. Similar comments were also made by villagers with regard to the resemblance of the superadobe structures to the animal shelters or round haystacks common in the region.[124] Again, these could have been addressed through an architectural-design exercise focusing on socio-cultural and visual implications.

The above inferences can be collated into two main recommendations that correspond to the two core components of social-justice intervention defined earlier — policy/agenda and implementation/enactment. In terms of policy, the most important takeaway is to confirm that while expensive technology solutions may be excellent as immediate, one-off handouts, in the long run they risk exacerbating social injustice by triggering ever-increasing dependence by local people on external assistance. Therefore, to promote concern for social justice at a systemic level, interventions should be based on technologies that are socioeconomically sustainable by matching as closely as possible the capacities of the local population. It follows that low-cost alternatives, such as the Heritage Foundation and the Cal-Earth models reviewed here, can best fulfill this aim; but other options may also be suitable if they are refined for local adaptation, such as ferro-cement solutions.[125] Whatever the case, the social and economic implications of all interventions should be explored by seeking feedback from local people before large-scale implementation is attempted.

The second recommendation that can be extracted from this report is to confirm the basic implementation/enactment concept of a sense of ownership. However, the incorporation of strategies to inculcate this quality suggested by U.N.-Habitat and the World Bank may only provide a starting point. It may be necessary to draw further insights from relevant bodies of knowledge, such as mass communications and behavior economics, in order to fine-tune the public-interaction aspect of any implementation effort. In particular, analytical decision-making tools can be explored, such as reference-class forecasting and discrete-choice analysis.[126] Furthermore, in the context of the Northern Areas of Pakistan specifically, the already tried-and-tested self-help concept, as practiced by initiatives of the Aga Khan Development Network, which provide the accompanying benefit of hands-on learning, may be highly useful.[127]

EARNEST PARTICIPATION NEEDED FOR SOCIAL JUSTICE AND SELF-SUFFICIENCY

Built-environment interventions in the Balakot region are at present for the most part fostering dependence rather than independence. New, safe building technologies being promoted by the government insufficiently address the key issue of affordability. Meanwhile, efforts to promote alternative technologies that do address affordability have yet to demonstrate reliable uptake.

In the case of the award-winning Cal-Earth alternative, deficiencies in enactment seem to have deprived local people of a fair opportunity to appreciate its benefits. Thus, despite an initial program of demonstration and application, the technology appears at present to have had nil uptake. This situation might be addressed in part by the deployment of a carefully designed participatory decision-making process to better enable local people to appreciate its benefits. However, such a renewed engagement with the technology would have to be designed with equal consideration for existing positive and negative realities. The Cal-Earth system may have received

FIGURE 17. *A school functioning in a temporary shelter.*

international acclaim among experts; yet it has demonstrably failed on the ground because its implementation was misconceived. This condition emerged despite concerted efforts to train field supervisors as well as the beneficiaries themselves. Design merit thus is a clearly different concern than practical realization. Without due consideration of the lessons learned from the failed 2006 implementation, any future attempt to promote the technology may meet the same fate.

On the whole, anomalies related to implementation of alternative construction technologies appear to be behind the observation by members of a local NGO that people are continuing to build with the same unsafe post-and-lintel technique that led to great loss of life and property in the 2005 earthquake. To help avoid a potential recurrence of this tragedy, this report has attempted to provide a framework for further exploration of improved interventions.

In conclusion, there is an urgent need for interventions aimed at reversing the prospect of future injustice through the creation of dependence on the part of the people of Balakot. As mentioned, these people have been deprived of the possibility of relocation. Safe new structures near their old settlement centers would thus appear to be their most pressing need. At present, the government has prohibited construction at the center of Balakot, and even schools in the area are in some cases still operating out of tents or freight containers **(FIG.17)**. A research project to explore alternative strategies to introduce affordable new technologies is presently underway by the first author, but more initiatives are needed.

REFERENCE NOTES

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1. N. Smith, "There's No Such Thing as a Natural Disaster," *Understanding Katrina: Perspectives from the Social Sciences*, Social Sciences Research Council (2006), available at http://understandingkatrina.ssrc.org/Smith/.
2. J.J. Rousseau and C. Kelly, *Rousseau on Philosophy, Morality, and Religion* (Hanover, NH: Dartmouth College Press, 2007).
3. S.T. Maqsood and J. Schwarz, "Analysis of Building Damage during the 8 October 2005 Earthquake in Pakistan," *Seismological Research Letters*, Vol.79 No.2 (2008), pp.163–77.
4. R. Langenbach, *Don't Tear It Down! Preserving the Earthquake Resistant Vernacular Architecture of Kashmir* (Oakland, CA: Oinfroin Media, 2009); Richard Hughes, "Vernacular Architecture and Construction Techniques in the Karakoram," in S. Bianca, ed., *Karakoram: Hidden Treasures in the Northern Areas of Pakistan* (Torino: U. Allemandi for Aga Khan Trust for Culture, 2005), pp.99–132; J. Harrison, "Kalaash Buildings," in E. Bashir and Israr-ud-Din, eds., *The Second International Hindukush Cultural Conference* (Chitral: Oxford University Press, 1990), pp.345–57; E. Bashir and Israr-ud-Din, "Discussion on Deforestation," in Bashir and Israr-ud-Din, eds., *The Second International Hindukush Cultural Conference*, pp.442–45; and J. Ali, T.A. Benjaminsen, A.A. Hammad, and Ø.B. Dick, "The Road to Deforestation: An Assessment of Forest Loss and Its Causes in Basho Valley, Northern Pakistan," *Global Environmental Change*, Vol.15 No.4 (2005), pp.370–80.
5. S. Adams and F. Atsu, "Aid Dependence and Economic Growth in Ghana," *Economic Analysis and Policy*, Vol.44 No.2 (2014), pp.233–42; and P. Martin, S.Z. Bigdeli, T. Daya-Winterbottom, W. Du Plessis, and A. Kennedy, *The Search for Environmental Justice* (Cheltenham: Edward Elgar Publishing, 2015).
6. P.P. Rogers, K.F. Jalal, and J.A. Boyd, *An Introduction to Sustainable Development* (Hoboken, NJ: Taylor & Francis, 2012), pp.5–21 and 154–76; and R.W.Y. Kao, *Sustainable Economy: Corporate, Social and Environmental Responsibility* (Singapore; Hackensack, NJ: World Scientific, 2010), pp.101–2.
7. "Nab Asked to Probe Delays in New Balakot City Project," *The Express Tribune*, September 26, 2012.

8. "Hazara Commissioner Says: 'ERRA Not Sincere in Rebuilding Efforts'," DAWN.com, March 13, 2013.
9. S. Rana, "Per Capita Income: A Pakistani Now Makes $1,513 a Year," *The Express Tribune*, May 20, 2015; and M.A. Khan, "The Question of Development: Chitral on Threshold of Change," *The Frontier Post*, September 21, 1990, p.2.
10. A.H. Dani, *History of Northern Areas of Pakistan: Up to 2000 A.D.* (Lahore: Sang-e-Meel Publications, 2001); H.H. Geerken and A. Bräker, *The Karakoram Highway and the Hunza Valley, 1998: History, Culture, Experiences* (Norderstedt: Books on Demand, 2017), p.58; F.E. Younghusband, *Wonders of the Himalaya* (New Delhi: Asian Educational Services, 1993 [1924]), p.178; and D.H. Childress, *Lost Cities of China, Central Asia and India* (Stelle, IL: Adventures Unlimited Press, 1991) p.263.
11. J. Harrison, "A Brief Introduction to the Architecture of the Kalasha, Chitral," in I. Stellrecht, ed., *Karakorum-Hindukush-Himalaya: Dynamics of Change* (Köln: Rüdiger Köppe, 1998), pp.527–50.
12. See Langenbach, *Don't Tear It Down!*; and Hughes, "Vernacular Architecture and Construction Techniques."
13. J.K. Bothara and K.M. Hiçyılmaz, "General Observations of Building Behaviour during the 8th October 2005 Pakistan Earthquake," *Bulletin of the New Zealand Society for Earthquake Engineering*, Vol.41 No.4 (2008), pp.209–33.
14. Maqsood and Schwarz, "Analysis of Building Damage."
15. Bothara and Hiçyılmaz, "General Observations of Building Behaviour."
16. A. Van Leersum and S. Arora, "Implementing Seismic-Resistant Technologies in Post-Earthquake Pakistan: A Process Analysis of Owner Driven Reconstruction," *Habitat International*, Vol.35 No.2 (2011), pp.254–64.
17. "CalEarth in the News: Aga Khan Award for Architecture [Recipient in 2004]," California Institute of Earth Art and Architecture (2015), available at https://calearth.org/in-the-news/index.html.
18. M.A. Khan, "Notes and Observations of Balakot Visits 2009–11" (2016).
19. K. Iveson, "Social or Spatial Justice? Marcuse and Soja on the Right to the City," *City*, Vol.15 No.2 (2011), pp.250–59; E. Soja, "The City and Spatial Justice," *Justice Spatiale/Spatial Justice*, Vol.1 (2009), pp.31–39 (available at https://www.jssj.org); P. Marcuse, "Spatial Justice: Derivative but Causal of Social Injustice," *Justice Spatiale/Spatial Justice*, Vol.1 (2009) (available at https://www.jssj.org); M. Nussbaum and A. Sen, *The Quality of Life* (New York: Oxford University Press, 1993); and A. Dong, "The Policy of Design: A Capabilities Approach," *Design Issues*, Vol.24 No.4 (2008), pp.76–87.
20. Martin et al., *The Search for Environmental Justice*.
21. Iveson, "Social or Spatial Justice?"; and Dong, "The Policy of Design."
22. "New Balakot City: Delay in Plots' Allotment to Be Protested," DAWN.com, December 8, 2012; and M. Iqbal, "Pakistan Administered Kashmir: Victims of 2005 Earthquake Still Groping in Darkness," *Ground Report* (2012), available at http://www.groundreport.com/Business/Pakistan-Administered-Kashmir-Victims-of-2005-Eart/2948426.
23. J.F. Kennedy, *Building without Borders: Sustainable Construction for the Global Village* (Gabriola, B.C.: New Society Publishers, 2009), p.96; and J.W. Murphy, *Community-Based Interventions: Philosophy and Action* (New York: Springer, 2014) p.9.
24. M. Yousuf and A. Farooq, "Housing Reconstruction Programme Pakistan: Report on Model Houses in the Two Union Councils (Shamlai District Batagram, Mohandri Tehsil Balakot)," in *The International Conference on Earthquake Engineering and Seismology (ICEES 2011)* (Islamabad: SCEE NUST, 2011); and U. Quzai, "Pakistan: Implementing People-Centred Reconstruction in Urban and Rural Areas," in M. Lyons, T. Schilderman, and C. Boano, eds., *Building Back Better: Delivering People-Centred Housing Reconstruction at Scale* (Warwickshire, U.K.: Practical Action Publishing, 2010).
25. M.Z. Zakar and R. Zakar, "Diffusion of Information Technology for Agricultural Development in the Rural Punjab: Challenges and Opportunities," *Pakistan Vision*, Vol.9 No.2 (2009), pp.136–74.
26. A.-U. Rahman, A.N. Khan, and R. Shaw, *Disaster Risk Reduction Approaches in Pakistan* (Tokyo: Springer, 2015).
27. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies."
28. Ibid.
29. M.A. Khan and L. Loke, "Reclamation of Public Space Authorship: What Does Augmented Reality Have to Offer," *IASTE Working Paper Series*, Vol.264 (Berkeley: International Association for the Study of Traditional Environments, 2014).
30. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies."
31. D.T.H. Giang and L.S. Pheng, "Role of Construction in Economic Development: Review of Key Concepts in the Past 40 Years," *Habitat International*, Vol.35 No.1 (2011), pp.118–25.
32. F. Krüger, G. Bankoff, T. Cannon, B. Orlowski, and E.L.F. Schipper, *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction* (London: Routledge, Taylor & Francis, 2015) p.46; and G. Ofori, *The Construction Industry: Aspects of Its Economics and Management* (Singapore: Singapore University Press, 1990) pp.90–95.
33. Khan and Loke, "Reclamation of Public Space Authorship"; and H. Glassie, *Vernacular Architecture* (Philadelphia: Material Culture; Bloomington: Indiana University Press, 2000).
34. M.G. Anderson and E. Holcombe, *Community-Based Landslide Risk Reduction: Managing Disasters in Small Steps* (Washington, DC: World Bank Publications, 2013).
35. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies."
36. Yousuf and Farooq, "Housing Reconstruction Programme Pakistan."
37. Dong, "The Policy of Design."
38. Iveson, "Social or Spatial Justice?"
39. Ali et al., "The Road to Deforestation"; and U. Schickhoff, "Himalayan Forest-Cover Changes in Historical Perspective: A Case Study in the Kaghan Valley, Northern Pakistan," *Mountain Research and Development*, Vol.15 No.1, (1995), pp.3–18.
40. N. Ahmad, Q. Ali, M. Ashraf, B. Alam, and A. Naeem, "Seismic Vulnerability of the Himalayan Half-Dressed Rubble Stone Masonry Structures, Experimental and Analytical Studies," *Natural Hazards and Earth System Science*, Vol.12 No.11 (2012), pp.3441–54; and M.A. Khan, I. Dar-Nimrod, L. Loke, P.F. Burke, and E. Wei, "What Values Do Villagers Consider When Deciding to Build in the Balakot Region?" (forthcoming: 2017).
41. Habitat for Humanity, "Pakistan Earthquake: Challenges & Innovations after the 2005 Earthquake," PDF report (2008), available at https://reliefweb.int/report/pakistan/pakistan-earthquake-challenges-innovations-after-2005-earthquake.
42. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies."
43. A. Özerdem, "The Mountain Tsunami: Afterthoughts on the Kashmir Earthquake," *Third World Quarterly*, Vol.27 No.03 (2006), pp.397–419.
44. Ahmad et al., "Seismic Vulnerability."
45 J. Bothara and S. Brzev, *A Tutorial: Improving the Seismic Performance of Stone Masonry Buildings* (Oakland, CA: Earthquake Engineering Research Institute, 2012).
46. Bothara and Hiçyılmaz, "General Observations of Building Behaviour."
47. H.M. Khan, A. Shah, I. Jan, and R. Khan, "Evaluation and Improvement of Seismic Performance of Locally Constructed Non-Engineered Buildings in the Earthquake Prone Areas of Pakistan," in *International Conference on Earthquake Engineering and Seismology (ICEES 2011)* (Islamabad: SCEE NUST, 2011).
48. Maqsood and Schwarz, "Analysis of Building Damage."
49. A. Naeem, Q. Ali, M. Javed, Z. Hussain, A. Naseer, S.M. Ali, I. Ahmed, and M. Ashraf, "A Summary Report on

Muzaffarabad Earthquake, Pakistan," University of Engineering and Technology, Peshawar, Pakistan (2005).
50. T. Rossetto and N. Peiris, "Observations of Damage Due to the Kashmir Earthquake of October 8, 2005 and Study of Current Seismic Provisions for Buildings in Pakistan," *Bulletin of Earthquake Engineering*, Vol.7 No.3 (2009), pp.681–99.
51. J.-P. Avouac, F. Ayoub, S. Leprince, O. Konca, and D.V. Helmberger, "The 2005, MW 7.6 Kashmir Earthquake: Sub-Pixel Correlation of Aster Images and Seismic Waveforms Analysis," *Earth and Planetary Science Letters*, Vol.249 No.3 (2006), pp.514–28.
52. Harrison, "Architecture of the Kalasha, Chitral"; R. Hughes, "Cator and Cribbage Construction of Northern Pakistan," in *Proceedings of the International Conference on the Seismic Performance of Traditional Buildings*, Istanbul, Turkey (2000), p.5, available at http://www.icomos.org/iiwc/seismic/Hughes-C.pdf; R. Langenbach, "Of Taq and Dhajji Dwari: The Earthquake Resistant Mud and Brick Architecture of Kashmir," in *6th International Conference on the Conservation of Earthen Architecture: Adobe 90 Preprints: Las Cruces, New Mexico*, USA (Los Angeles, CA: Getty Conservation Institute, 1990), pp.92–98; D. D'Ayala and S.S.R. Bajracharya, "Traditional Nawari House in Kathmandu Valley," in A. Charleson, ed., *World Housing Encyclopedia: An Encyclopedia of Housing Construction in Seismically Active Areas of the World* (Oakland, CA: Earthquake Engineering Research Institute and International Association for Earthquake Engineering, 2003).
53. Ali et al., "The Road to Deforestation"; and Hughes, "Cator and Cribbage Construction."
54. Bashir and Israr-ud-Din, "Discussion on Deforestation"; Khan, "The Question of Development"; K. Haserodt, "Geographical Features and Problems of Chitral: A Short Introduction," in Bashir and Israr-ud-Din, ed., *The Second International Hindukush Cultural Conference*, pp.3–18; M. Lines, "A Sad Legacy," in Bashir and Israr-ud-Din, ed., *The Second International Hindukush Cultural Conference*, pp.439–41; and Israr-ud-Din, ed., *Proceedings of the Third International Hindu Kush Cultural Conference* (Oxford and Karachi: Oxford University Press, 2008).
55. Ali et al., "The Road to Deforestation"; Hughes, "Cator and Cribbage Construction"; and E. Aftab and G.M. Hickey, "Forest Administration Challenges in Pakistan: The Case of the Patriata Reserved Forest and the 'New Murree' Development," *International Forestry Review*, Vol.12 No.1 (2010), pp.97–105.
56. Dani, *History of Northern Areas of Pakistan*; and Hughes, "Cator and Cribbage Construction."
57. Langenbach, *Don't Tear It Down!*; and Hughes, "Vernacular Architecture and Construction Techniques."
58. Schickhoff, "Himalayan Forest-Cover Changes"; and S. Khalil, M.K. Kakar, and A. Malik, "Role of Tourism in Economic Growth: Empirical Evidence from Pakistan Economy [with Comments]," *The Pakistan Development Review* (2007), pp.985–95.
59. Harrison, "Kalaash Buildings"; Harrison, "Architecture of the Kalasha, Chitral"; and Özerdem, "The Mountain Tsunami."
60. Khan et al., "What Values Do Villagers Consider?"
61. K.K. Mumtaz, *Architecture in Pakistan* (Singapore: Concept Media, 1985), p.116; Y. Lari and M.S. Lari, *The Dual City: Karachi During the Raj* (Karachi: Heritage Foundation and Oxford University Press, 1996), p.191; and I. Faizi, "The Future of Chitrali Culture and Literature: A Challenge for Social Scientists," in Bashir and Israr-ud-Din, ed., *The Second International Hindukush Cultural Conference*, pp.447–52.
62. Khan et al., "What Values Do Villagers Consider?"; C. Markovitz, *A History of Modern India: 1480–1950* (Paris: Anthem Press, 2002); K. Nadvi and M. Robinson, "Pakistan Drivers of Change," Sussex, U.K., Institute of Development Studies (2004); D. Ratha, "Workers' Remittances: An Important and Stable Source of External Development Finance," World Bank (2005), available at http://repository.stcloudstate.edu/econ_seminars/9; and A. Hassan, "Reconstruction of Earthquake Affected Areas," Asian Coalition for Housing Rights (2005), available at http://arifhasan.org/articles/reconstruction-of-earthquake-affected-areas.
63. K. Hollinshead, "The Worldmaking Prodigy of Tourism: The Reach and Power of Tourism in the Dynamics of Change and Transformation," *Tourism Analysis*, Vol.14 No.1 (2009), pp.139–52.
64. R. Langenbach, "Intuition from the Past: What We Can Learn from Traditional Construction in Seismic Areas," in *Proceedings of the Conference "Earthquake Safe,"* Istanbul (2000), available at http://www.conservationtech.com/IstanCon/keynote.htm.
65. Bothara and Brzev, *A Tutorial*; Khan et al., "Evaluation and Improvement of Seismic Performance"; S. Nienhuys, "Galvanisd Wire Reinforcement (GWR) Technology" (2013), available at http://dl.lib.mrt.ac.lk/handle/123/9443; A.K. Jha, J.D. Barenstein, P.M. Phelps, D. Pittet, and S. Sena, *Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters* (World Bank/GFDRR, 2010), p.170, available at https://openknowledge.worldbank.org/handle/10986/2409; and UNDP-IRP, *Guidance Note on Recovery: Shelter* (UNDP-India/IRP, 2011), p.170, available at http://www.undp.org/content/dam/india/docs/guidance_note_on_recovery_shelter.pdf
66. Yousuf and Farooq, "Housing Reconstruction Programme Pakistan."
67. J.-Y. Gerlitz, K. Hunzai, and B. Hoermann, "Mountain Poverty in the Hindu-Kush Himalayas," *Canadian Journal of Development Studies/Revue Canadienne d'études du développement*, Vol.33 No.2 (2012), pp.250–65.
68. Ahmad et al., "Seismic Vulnerability."
69. Khan, "Notes and Observations."
70. Iveson, "Social or Spatial Justice?"
71. Dong, "The Policy of Design."
72. Jha et al., *Safer Homes, Stronger Communities*.
73. Ibid.
74. U.N.-Habitat-Pakistan, "Environmental Planning Volume II," in *Housing after Disasters Guide* (Islamabad: 2011).
75 Ibid.
76. I. Ahmed, "An Overview of Post-Disaster Permanent Housing Reconstruction in Developing Countries," *International Journal of Disaster Resilience in the Built Environment*, Vol.2 No.2 (2011), pp.148–64.
77. M. Gharaati, "An Overview of the Reconstruction Program after the Earthquake of Bam, Iran," in *I-Rec 2006 International Conference on Post-Disaster Reconstruction: Meeting Stakeholder Interests* (2006), p.453; and M. Joodi, "A Brief Review on Bam Reconstruction Program," Housing Foundation of Iran (2004).
78. M. Gharaati and C. Davidson, "Who Knows Best? An Overview of Reconstruction after the Earthquake in Bam, Iran," in *Proceedings of the 4th International I-Rec Conference, University of Canterbury, Christchurch, New Zealand* (Indonesia and Aid Watch, 2008).
79. Ibid.
80. Iveson, "Social or Spatial Justice?"
81. Dong, "The Policy of Design."
82. Ibid.
83. Iveson, "Social or Spatial Justice?"
84. ERRA, "Earthquake Reconstruction and Rehabilitation Authority" (2015), available at http://www.erra.pk/.
85. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies"; ERRA, "Special Project Cell" (2015), available at http://www.erra.pk/othersections/SpecialProjectCell/spc.asp; and UNDP-Pakistan, *Evaluation of UNDP's Earthquake Response Programme in Pakistan* (Islamabad: United Nations Development Programme-Pakistan, 2008), p.50.
86. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies"; and UNDP-Pakistan, *Evaluation of UNDP's Earthquake Response Programme*.
87. Van Leersum and Arora, "Implementing Seismic-Resistant Technologies."
88. Ibid.

89. Ibid.
90. Quzai, "Pakistan: Implementing People-Centred Reconstruction."
91. Dong, "The Policy of Design"; and Iveson, "Justifying Exclusion: The Politics of Public Space and the Dispute over Access to McIvers Ladies' Baths, Sydney," *Gender, Place & Culture*, Vol.10 No.3 (2003), pp.215–28.
92. The Citizens Foundation, "The Citizens Foundation" (2015), available at http://www.tcf.org.pk/.
93. Globalgiving, "Progress Report: Construction of TCF Schools in Pakistan's Earthquake Affected Areas" (2007), available at http://www.globalgiving.org/pfil/1578/Progress Report-global.doc.
94. Heritage Research Centre, *Green Karavan Ghar* (Karachi: Heritage Foundation of Pakistan, 2013).
95. Ibid.
96. S. Rana, "Per Capita Income: A Pakistani Now Makes $1,513 a Year"; and T.C. Schaffer, *Kashmir: The Economics of Peace Building: A Report of the CSIS South Asia Program with the Kashmir Study Group* (Washington, DC: CSIS Press, 2005).
97. Heritage Research Centre, *Green Karavan Ghar*.
98. Cal-Earth, "CalEarth in the News: Aga Khan Award for Architecture [Recipient in 2004]"; "Aga Khan Award for Architecture," *ArchitectureWeek*, January 9, 2002, pp.N1.1-3; AKDN-AKAA, "2004 Cycle Steering Committee Members," The Aga Khan Development Network-Aga Khan Award for Architecture (2007), available at http://www.akdn.org/architecture/steering_committee.asp?tri=2004; AKDN-AKAA, "2004 Cycle Master Jury Members," The Aga Khan Development Network-Aga Khan Award for Architecture (2007), available at http://www.akdn.org/architecture/jury.asp?tri=2004; and AKDN-AKAA, "2004 AKAA Recipients: Sandbag Shelters: Jury Citation," in *Aga Khan Award for Architecture* (The Aga Khan Development Network, 2004).
99. Cal-Earth Institute, "Emergency Sandbag Shelter (Training Guide)" (2005), available at http://calearth.org/building-designs/emergency-sandbag-shelter.html (accessed June 20, 2017).
100. Ibid.
101 Cal-Earth Institute, "Demovideo" (2005), available at https://http://www.youtube.com/watch?v=bnWw_PrJB48 (accessed June 20, 2017).
102. Ibid.
103. Cal-Earth Institute, "Apprentice Alumni" (2005), available at http://calearth.org/learn-to-build/apprentice-alumni.html (accessed June 20, 2017); and A. López-Claros and S. Hidalgo, *Humanitarian Response Index 2007: Measuring Commitment to Best Practices* (New York: Palgrave Macmillan, 2007).
104. Khan, "Notes and Observations"; and Cal-Earth, "Apprentice Alumni."
105. Khan, "Notes and Observations."
106. Ibid.
107. Ibid.
108. A.S. Arya, T. Boen, and Y. Ishiyama, *Guidelines for Earthquake Resistant Non-Engineered Construction* (Paris: UNESCO, 2014).
109. Ibid.
110. Khan, "Notes and Observations."
111. K.K. Mumtaz, "Traditional Forms of Rural Habitat in Pakistan," in *Human Settlements and Socio-Cultural Environments* (Paris: UNESCO, 1976); and Webpakistan, "Cholistan Desert" (2015), available at http://webpk9.blogspot.com.au/2015/03/cholistan-desert.html.
112. Webpakistan, "Cholistan Desert."
113. Khan, "Notes and Observations."
114. Ibid.
115. Cal-Earth Institute, "Emergency Sandbag Shelter (Training Guide)"; and Cal-Earth Institute, "Demovideo."
116. Khan, "Notes and Observations."
117. Iveson, "Social or Spatial Justice?"
118. Dong, "The Policy of Design."
119. AKDN-AKAA, "2004 Cycle Steering Committee Members"; and AKDN-AKAA, "2004 AKAA Recepients: Sandbag Shelters: Jury Citation."
120. C. Long, *Participation of the Poor in Development Initiatives: Taking Their Rightful Place* (London: Earthscan, 2001).
121. Global500, "Adult Award Winner: Shoaib Sultan Khan" (2014), available at http://www.global500.org/index.php/thelaureates/online-directory/item/526-shomb-sultan-khan; and Ashden, "AKRSP, Pakistan" (2015), available at https://http://www.ashden.org/winners/akrsp.
122. Jha et al., *Safer Homes, Stronger Communities*; UNDP-IRP, *Guidance Note on Recovery*; L. Lankatilleke, "The People's Process: The Viability of an International Approach," in Lyons, Schilderman, and Boano, eds., *Building Back Better*, pp.66–67; and T. Schilderman, "Putting People at the Centre of Reconstruction," in Lyons, Schilderman, and Boano, eds., *Building Back Better*, pp.7–23.
123. Khan, "Notes and Observations."
124. Ibid.
125. M.A. Saleem and M. Ashraf, "Low Cost Earthquake Resistant Ferrocement Small House," *Pakistan Journal of Engineering and Applied Science*, Vol.2 (2008).
126. Khan et al., "What Values Do Villagers Consider?"; P.F. Burke, C. Burton, T. Huybers, T. Islam, J.J. Louviere, and C. Wise, "The Scale-Adjusted Latent Class Model: Application to Museum Visitation," *Tourism Analysis*, Vol.15 No.2 (2010), pp.147–65; J.J. Louviere, D.A. Hensher, and J.D. Swait, *Stated Choice Methods: Analysis and Applications* (Cambridge and New York: Cambridge University Press, 2000); P. Slovic, M.L. Finucane, E. Peters, and D.G. Macgregor, "The Affect Heuristic," *European Journal of Operational Research*, Vol.177 No.3 (2007), pp.1333–52; A. Tversky and D. Kahneman, "Rational Choice and the Framing of Decisions," *Journal of Business* (1986), pp.251–78; A. Tversky and E. Shafir, *Preference, Belief, and Similarity: Selected Writings* (Cambridge, MA: MIT Press, 2004); and D. Kahneman, *Thinking, Fast and Slow* (New York: Penguin Books Limited, 2011).
127. P. Haar, "A Self-Help Approach to Remote Area Housing: St Paul's Village, Moa Island, Torres Strait, 1986–92," in P. Reed, ed., *Settlement: A History of Australian Indigenous Housing* (Canberra: Aboriginal Studies Press, 2000), p.221; I. Nonaka and R. Toyama, "Strategic Management as Distributed Practical Wisdom (Phronesis)," *Industrial and Corporate Change*, Vol.16 No.3 (2007), pp.371–94; and B.K. Mumtaz, J. Norton, and A. Hasan, *An Evaluation of the Self-Help Schools Construction Programme, Pakistan* (Geneva: Aga Khan Foundation, 1989).