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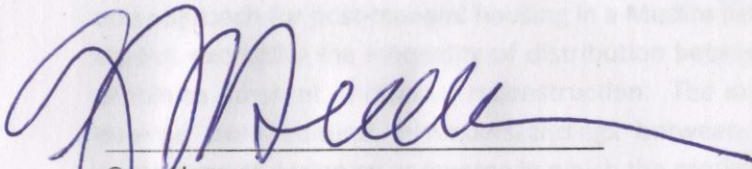
Rebuilding After a Natural Disaster:  
Housing Strategies for Minority Communities in Post-Tsunami Sri Lanka

A thesis submitted in partial fulfillment  
of the requirements for the degree of  
Bachelor of Architecture

by

Katherine Dombek

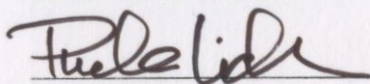
May 2016  
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# **Rebuilding After a Natural Disaster: Housing Strategies for Minority Communities in Post-Tsunami Sri Lanka**

Katherine Dombek

May 5, 2016

## **Abstract**

On December 26, 2004, an earthquake measuring 9.0 on the Richter scale caused one of the most catastrophic disasters in recent history: the Indian Ocean Tsunami. Also called the Boxing Day Tsunami, this event devastated communities along the coast of the Indian Ocean killing around 230,000 people and displacing around 1.7 million. One of the worst affected countries was Sri Lanka which suffered the greatest loss in relative terms. In Sri Lanka 36,000 people were killed and about 500,000 were displaced by the tsunami with five percent of the population being directly affected. The initial relief activities were relatively successful given the circumstances. However, the reconstruction and rehabilitation of the island country proved to be much more difficult: complaints arose about the longevity of the reconstruction process; concerns surfaced about the inequality of building construction and funds distribution; rising construction cost worsened the situation as did the on-going conflict between the Government of Sri Lanka (GoSL) and the Liberation Tigers of Eelam (LTTE). With the recent completion of housing projects and the victory of the GoSL over the LTTE, it now seems appropriate to reevaluate the rebuilding of communities in Sri Lanka. This project attempts to understand the cultural, political, and economic complexities that are involved in rebuilding the broken communities in Kurukkalamadam and Kirinda, Sri Lanka. In Eastern Sri Lanka, the Smart Shelter Foundation worked on houses for Hindu families in Kurukkalmadam. Shigeru Ban's housing project in Kirinda is an example of one approach for post-tsunami housing in a Muslim fishing village in Southern Sri Lanka. These two case studies exemplify the inequality of distribution between the provinces of Sri Lanka and also reveal the problems inherent in disaster reconstruction. The most prevalent of these issues is that design flaws emerge from cultural misunderstandings between the donor and recipient. Therefore, a new conception of design must emerge in which the problem of rebuilding after a disaster is approached as a partnership between these two entities.

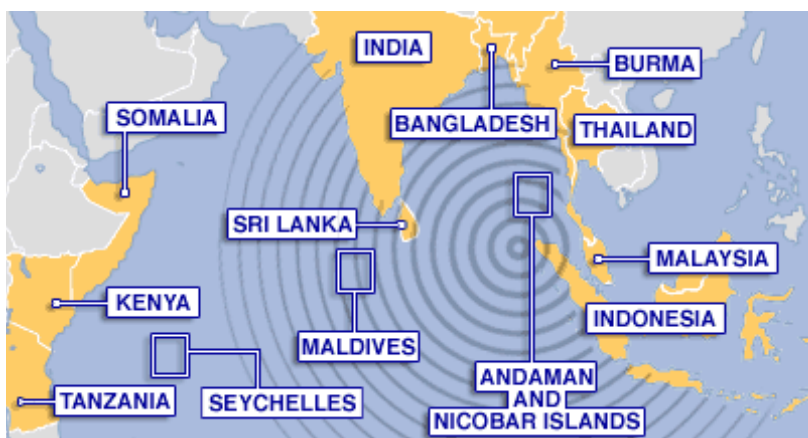
## Effect of the Tsunami on Sri Lanka

An earthquake measuring 9.0 on the Richter scale struck on December 26, 2004 near Sumatra off the coast of Indonesia within the Indian Ocean. The subduction of the Indian plate beneath the Burmese plate resulted in a vertical displacement of fifteen meters in the Sunda trench. This sudden displacement caused a massive tsunami, called the Indian Ocean Tsunami or the Boxing Day Tsunami, which had catastrophic consequences for the entire region. Widespread destruction was followed by extensive recovery work. In the years to follow, the provision of shelter and housing became symbols of the success of recovery process as a whole and were seen as tools with the power to develop and rebuild communities.

The 2004 Indian Ocean Tsunami has been labeled as “the worst natural disaster in recent history” because of the sheer number of heavily occupied and vulnerable coastal communities that were affected. (BBC NEWS, 2004) Within twenty minutes of the earthquake, the first waves began to hit Indonesia, which because of its close proximity to the epicenter (3.24°, 95.82°), suffered the most damage. In Indonesia, 167,540 people were killed and 566,898 people were displaced by the tsunami. Sri Lanka, India, and Thailand also lost a significant number of people, and many other countries in the region and beyond were affected by the tsunami. The tsunami even reached the east coast of Africa killing people in Somalia, Kenya, and Tanzania. In all, 227,898 people were killed and 1,768,260 people were displaced in fourteen countries. Almost fifty other countries lost citizens who were abroad at the time of the tsunami. The destruction and loss registered on a global level.

The far-reaching devastation triggered a global response like no other seen before. Governments, International Non-Governmental Organizations, and local Non-Governmental Organizations (NGOs) quickly mobilized with a staggering magnitude to provide relief to tsunami affected areas. The disaster was widely covered by the media which led to private donors world-wide making very significant contributions to the tsunami recovery fund. In 2005, private donations in the international humanitarian sector exceeded the amount of donations from 2004 by almost 50 percent. This unprecedented and atypical rise in donations substantially exceed the projected economic growth of this sector. The boost in disaster funding following the 2004 Indian Ocean Tsunami marked an extreme explosion in the number of organizations active in disaster areas, a trend which has continued for over a decade and show no sign of slowing.

As a small island nation with many coastal settlements, Sri Lanka suffered the greatest loss in terms relative to its pre-tsunami condition. 35,322 people were killed in Sri Lanka and 519,063 were

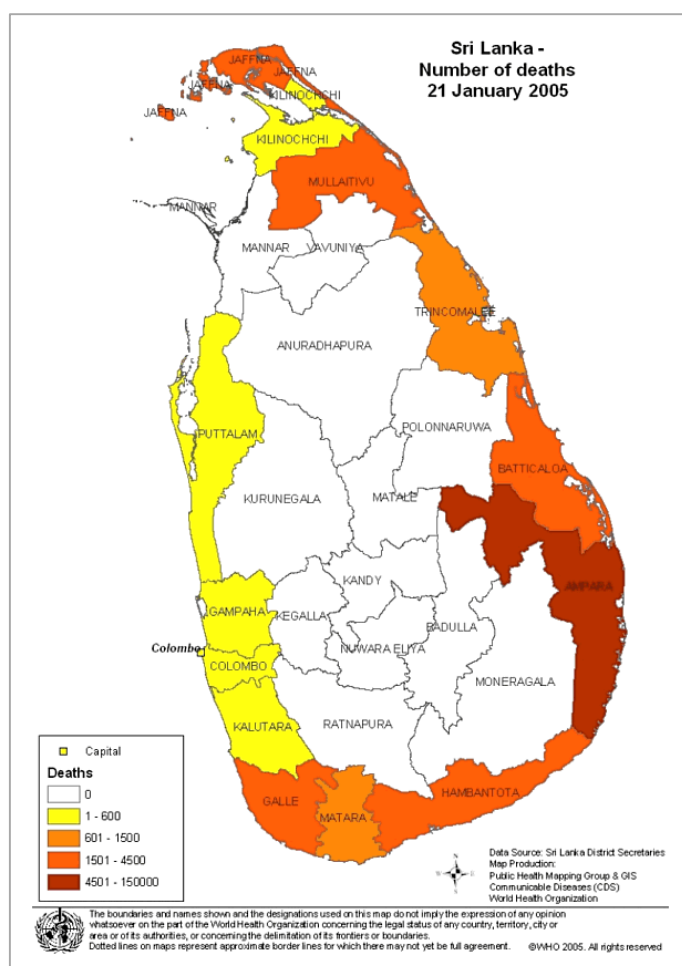


This map illustrates the countries most affected by the Indian Ocean Tsunami. Indonesia, Sri Lanka, India, and Thailand suffered the greatest loss with many other countries in the region receiving minor damage and loss of life as well.

displaced by the tsunami. As with many other countries in the affected region, the great loss of life was partially (if not chiefly) due to the lack of an early warning system. Unlike Pacific nations, the countries of the Indian Ocean do not frequently experience tsunamis. Although Sri Lanka's coastal settlements are often located on flat lands which are subject to an increased risk for floods and cyclones, the country had never experienced a natural disaster at such a monstrous scale. An ambassador of Sri Lanka stated that "In Sri Lanka's living memory, there had been no experience of a tsunami; the very terminology to describe that phenomenon had not even existed." (United Nations, 2005)

Another existing vulnerability, which worsened the effect of the tsunami on Sri Lanka was the 20-year civil war between the Government of Sri Lanka and the Liberation Tigers of Tamil Eelam. Many people (particularly those in the Northern and Eastern Provinces) had already been displaced because of this war and were therefore already living in less than ideal conditions when the tsunami struck. When tsunami aid began to arrive, many who were desperate for help did not qualify for new houses because they were not directly affected by the tsunami (even if they were living in temporary shelters the same as tsunami victims). This led to a lot of frustration within communities because victims of the conflict in desperate situations could not understand why they were being passed over for aid in favor of tsunami victims. The war also made it more difficult to evaluate conditions and distribute aid in tsunami-affected areas which were under LTTE control.

Despite these factors, the immediate relief efforts have been deemed a relative success. Local



District/Province	Displaced*	Deaths*
Galle	128,077	4,214
Matara	13,305	1,342
Hambantota	17,735	4,500
Southern Province	159,105	10,056
Colombo	31,239	79
Gampaha	1,449	6
Kalutara	27,713	256
Western Province	60,401	341
Ampara	75,238	10,440
Batticaloa	61,912	2,840
Trincomalee	81,643	1,078
Eastern Province	218,793	14,358
Jaffna	39,907	2,640
Mullaitivu	22,557	3,000
Killinochchi	1,603	500
Northern Province	64,067	6,140
<b>Total</b>	<b>502,366</b>	<b>30,895</b>

\* As of January 2005

communities already had the knowledge and skills needed to respond to this disaster even though the scale was such as they had never seen. In the immediate aftermath, individuals within these communities joined together to begin relief activities. Rescue services, burial of the dead and provision of food, water, and clothing were carried out to a general degree of satisfaction in all districts of Sri Lanka. Temporary shelter was provided in schools, other public buildings and tents. Thanks to Sri Lanka's previous investments in public health education and awareness and Sri Lanka's experience with minor coastal natural disasters, there were no disease outbreaks. However, with the quick ending of the relief phase of recovery came the more complicated tasks of rehabilitation and reconstruction and while the relief phase was met with a certain degree of success, these next two stages were not always carried out in a timely, satisfying and appropriate manner. The rehabilitation of Sri Lankan communities proved to be a very difficult task with many problems.

### **Challenges Associated with Rehabilitation in Sri Lanka**

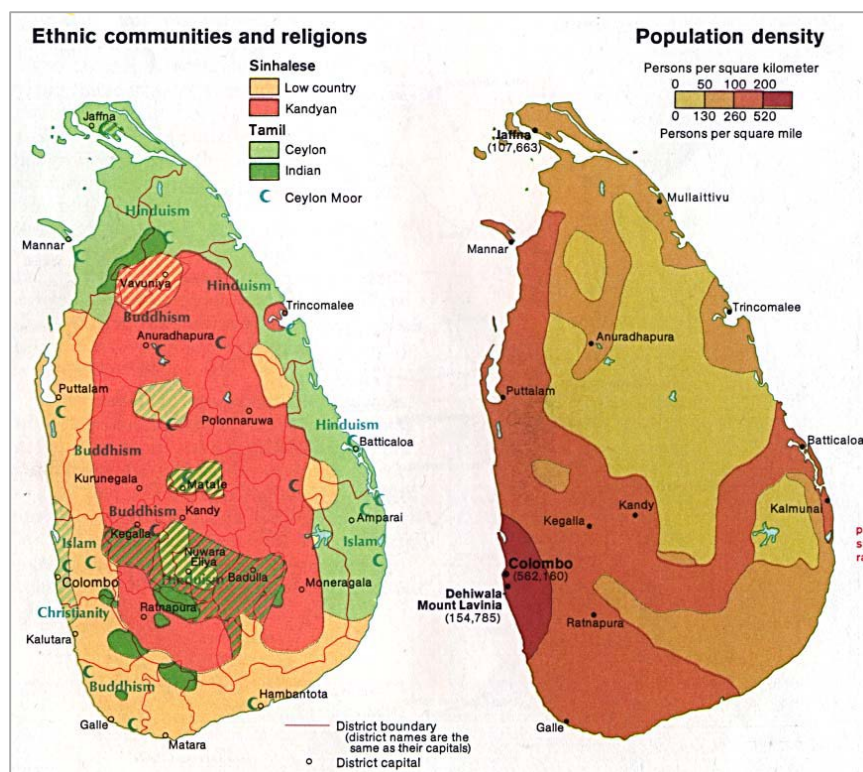
As a whole, the rebuilding in Sri Lanka was slow and inconsistent. Problems arose in both policy and design. Examples of failure can be found at every level of the process: from the apathy of individual households to take charge of their own futures, to the ineffectuality of political leaders in peace talks which might have made an equal distribution of aid, to the arrogant attitude of the international aid sector which often utilized abrasive and ignorant decisions in housing designs. After a disaster, the goal is to return to a condition of "normalcy" as quickly as possible. Speed is one of the main factors that is evaluated when determining the success (or failure) of a response to a natural disaster. For victims, living in temporary housing for an extended period of time can be just as traumatizing as the disaster itself. In addition, interest in a disaster on a global scale will inevitably diminish faster than rehabilitation can occur. When the 2004 India Ocean Tsunami swept over Southeast Asia, it received an enormous amount of media and donor attention worldwide, unprecedented in scale for a natural disaster. This attention lasted through the relief phase of disaster recovery in Sri Lanka, but had faded by the time the rehabilitation phase gained traction. This is unfortunate since it is the rehabilitation phase, and not the relief phase, that requires more funding, attention, and time.

NGOs, armed with massive amounts of funding provided mostly by private donors, rushed to complete projects to prove their usefulness to the donors who were also eager to see tangible results. Since each NGO was relatively well funded, there was little coordination between groups and the organizations were competing to complete their own projects. As a result of this rush, many organizations (some not even properly equipped or trained for the services they were offering) sacrificed quality of design or construction for speed and often completely skipped needs assessments. It was not uncommon for the NGOs (particularly International NGOs) to completely fail to consider the lifestyles of those whom they were building for. Many new houses incorporated expensive sources of fuel for cooking (gas/electric) which the family could not afford and did not offer a kitchen which could accommodate firewood cooking. A lack of accountability or organization of the many NGOs contributed to the inefficiency of the entire rehabilitation process: despite the large amounts of funding, the lack of thoughtful cost and needs assessments<sup>1</sup>, administrative overhead costs, and poor tracking of money meant that in many cases these organizations were unable to meet even half of their original target goals for housing.

In a series of interviews with officials and diplomats involved in Sri Lankan recovery, analyst Alan Keenan discovered that "Trying to spend a lot of money fast leads to corruption, centralization, raised

costs and other disruptions due to the lack of local capacity to absorb the funds.” And that inevitably there will be “pockets that are undersubscribed and others that are oversubscribed.” (McGilvray, 2010) The issue of funding had many facets that contributed overall rehabilitation problem. Sri Lanka received 1.8 billion US dollars (USD) which, according to early needs assessments, should have been enough money to recuperate the country’s losses from the tsunami. However, the absorption capacity of the GoSL was not great enough (or the GOSL lacked the experience and order) to effectively distribute funds. A GoSL official stated, “There was so much funding that it was economically overwhelming.... It was too much to deal with. Not all can be spent, and not all has been spent on valuable things.” (McGilvray, 2010) Before distributing aid and allowing projects to begin, the GoSL had to first determine and communicate who should receive aid, where reconstruction should occur, and how to reimburse victims of the disaster. In terms of measurable rehousing, little had been accomplished in the first year. In late 2005, it was assumed that less than fifteen percent of the aid funds had been distributed.

On top of the overall slow distribution of aid, there was a serious inequality in the distribution of aid (both in quantity and quality). This fed feelings of resentment among the communities of Sri Lanka, primarily between the Sinhalese and Tamil ethnic groups.<sup>2</sup> As a result of the entrenched Sinhalese power which dominated Sri Lanka, the Tamil Hindu and Muslim minorities often felt like they were being further alienated throughout the rehabilitation process. The greatest need was in the Eastern Province, however, money was being spent faster and more often in the Southern Province. Polls have shown that living standards in the Southern Province, (as compared to Eastern), were higher even before the tsunami. Households in this province were much more likely to have indoor water taps, flush toilets, or an electric lighting source. Following the tsunami, these already more stable communities were being privileged in the reconstruction process. One of the most obvious examples of this can be found in the district Hambantota in the Southern Province. Here, the average expenditure in USD per house was

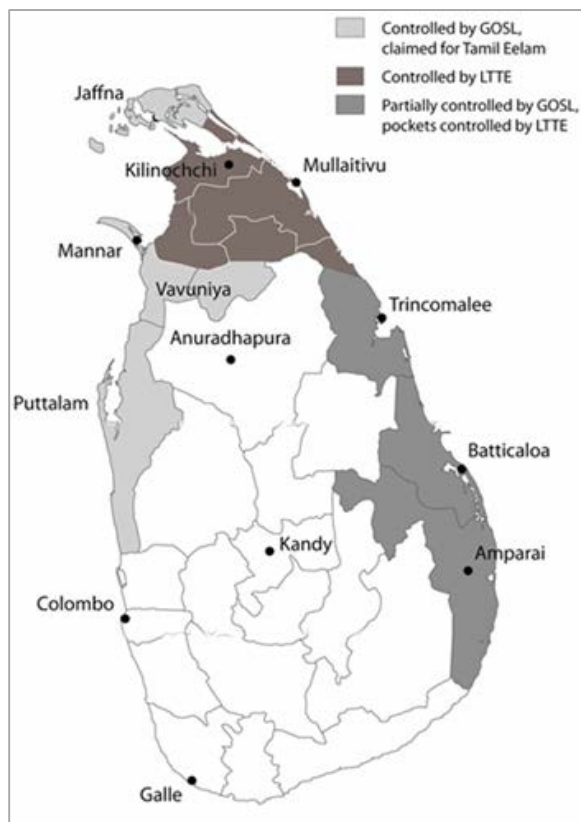


The Sinhalese (primarily Buddhist) occupy the most heavily settled and developed parts of Sri Lanka in the southwest. The Tamil (primarily Hindu) populations occupy the more remote northern and eastern coasts of Sri Lanka. Ceylon Moors (primarily Islamic) live in pockets located all over the island but are mostly concentrated on the coasts as remnants of a great trading empire.

19,185 and more houses were constructed than were destroyed in the tsunami. In the districts of Ampara and Batticaloa in the Eastern Province, this average was less than 3,000 USD per house.

Several factors contributed to this unequal aid distribution. The concentration of resources in the Southwest is a clear example of “tarmac bias”, where locations chosen to receive aid are selected because they are easier to access. In any country, the political centers are going to be the more accessible points for finance, imported materials, and, in the case of disasters, relief workers. Colombo is the political, economic, and social capital of Sri Lanka located in the southwest and is where the distribution of all foreign aid originated. The network surrounding the capital allowed for a better dissemination of information and knowledge of working conditions and the technical aspects of transporting supplies in the areas closer to this area and that availability of information directly translated into the amount of aid received. Affected communities near the capital saw about twice as many humanitarian aid workers as those in areas which were farther away with the same needs.

The on-going conflict certainly contributed to the inequality in aid distribution as well. Some of the worst affected areas were in LTTE controlled territory but foreign aid was controlled by the GoSL. Roads leading to or within zones of conflict were heavily dotted with military checkpoints and the rules about what could be brought into a certain zone were very strict. Cement and other building materials were very difficult to get into these zones. Some Non-Governmental Organizations working within LTTE areas were accused of actively assisting “terrorists” and in extreme circumstances were banned from the country or even subject to physical violence. This made it more difficult and certainly more dangerous for humanitarian organizations to work in the Northern and Eastern Provinces. In June 2005, after a long series of negotiations, the Post-Tsunami Operation Management Structure (P-TOMS) was signed which would allow for the sharing of supplies between the GoSL and the LTTE and would be



In the years following the 2004 Indian Ocean Tsunami, the northern and eastern coasts of Sri Lanka were either partially or fully controlled by the LTTE. With aid and supplies primarily being distributed by the GoSL from Colombo, it became very difficult to provide relief to those affected the tsunami in these areas.

moderated by a multilateral agency. However, this agreement was quickly rendered useless by a challenge in the Supreme Court and relations between the GoSL and LTTE only worsened.<sup>3</sup> Some people in the Northern Province (controlled by the LTTE) who were displaced by the tsunami in 2004, had to go without permanent housing until after the resolution of the 26-year war in 2009.

Corruption, although reportedly not as rampant as it was in Indonesia, was still a factor in post-tsunami Sri Lanka. The impoverished condition of coastal communities existed before the tsunami and many families who were not directly affected by the tsunami still felt entitled to the sudden influx of aid because their situation was just as desperate as those who were affected. Therefore, deciding who made the list to receive tsunami aid was difficult and created tensions within these communities. There have been several reported incidents of community officials accepting bribes in exchange for a place on the list of those who may receive tsunami aid. Also, politicians in positions of power could assign significant portions of aid to their hometowns without giving preference to communities which had a greater need. And since the GoSL was dominated by Sinhalese (which live primarily in the Western and Southern Provinces), it follows that these Provinces would be the ones to benefit. One diplomat highlighted this phenomenon saying, "The south has some very senior politicians. Their areas have gotten a lot of resources...." (McGillvray, 2010)

One of the most controversial issues with regards to rehabilitation policy was the introduction of a buffer zone which was intended to discourage people from rebuilding within a certain distance of the shore line. This considerably limited the amount of land which was available to build on, in areas where it was already a challenge to find space for rebuilding. The buffer zone policy was attacked by victims and NGOs, and it was one of the primary reasons that reconstruction proceeded so slowly. The system was also accused of being unfair with the reimbursement and relocation for tsunami victims. On the east coast, a family which lived 195 meters away from the shore would be told they would receive no funding to rebuild their house unless they relocated farther offshore. However for a family located ten meters away (205 meters from the shore), the government would provide grants or loans so they could rebuild on the same locations. The line which designated buffer zone was completely arbitrary and did not take into account topography or other features of the land that would affect the hazard risk of a particular plot of land. Also, the rules of the buffer zone did not apply to all buildings, such as hotels for tourists, which further aggravated those who were forced to move. The rule was particularly opposed by fishermen who argued that they needed to retain houses close to the shore in order to maintain their livelihoods. In May 2006, the buffer zone policy was relaxed with the hope that the speed of rehabilitation could increase.

The rehabilitation in Sri Lanka took two forms: the Owner-Built Program (in which the owner of the house would receive funds and was responsible for the building of the house) and the Donor-Built Program (in which an NGO would follow standard building requirements set forth by the GoSL and work with contractors to build houses for recipients selected by the GoSL). Because of the overwhelming number of NGO activities taking place in the Southern Province, the Donor-Built took off in the Southern Province with over 5,000 houses being built in this province through that program. In all other areas of Sri Lanka however, the Owner-Built Program was far more successful, both in terms of quality and quantity of houses. Within this program, households were able to build their homes much faster (sometimes surpassing the number of houses built by the Donor-Built Program by nearly four times). The Owner-Driven Program also allowed the people to design houses that fit their specific needs. For example, one family decided to build a seemingly strange upper level to their house which was in fact designed to house their children who were now afraid of living on the ground floor because of their fear

of rising water. Another important feature of the Owner-Driven Program that can easily be underestimated is the sense of empowerment and ownership that accompanies taking charge of one's own future. Households which utilized this program were much more invested in their own lives, actively participating in the design and construction of their homes. Those under the Donor-Built program however, were more likely to become dependent on the system and developed ambivalent attitudes in regards to the construction of their future homes. Instead of participating in the construction of their future homes, they preferred to find work elsewhere hoping to make some extra money while someone else completed their house. And upon completion, the family was often dissatisfied with the house because they compared the outcome to houses completed by other organizations which may have had more time, money, or resources.

In the Donor-Driven Program, post-tsunami housing was a responsibility that was shared by the GoSL and NGOs (and individual home owners utilizing the Owner-Driven Program). The GoSL was in charge of the distribution and allocation of land while the construction of housing was the responsibility of the NGOs. The government also set up fixed standards of design, which allowed for only a little variation for the designers of the NGOs. This meant that the government had the greatest degree of control over the design of the average house in post-tsunami coastal Sri Lanka. The benefits of having fixed standards of design guaranteed that minimal tangible housing requirements were met (houses must be equal to or greater than 500 sq. ft. for example) and tamed the wild ranges between the "expensive" and "inexpensive" tsunami housing projects. However, these regulations also made it difficult to adapt specific housing strategies to specific regions resulting in a single national type of

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District/Province	Owner-Driven Program		Donor-Driven Program	
	Completed	Required	Completed	Required
Galle	11,405	3,720	2,793	9,590
Matara	6,048	2,120	1,372	5,409
Hambantota	1,469	4,643	4,162	1,344
Southern Province	18,922	10483	8,327	16,343
Colombo	60	1,387	107	53
Gampaha	253	436	218	234
Kalutara	5,290	2,862	1,687	4,537
Western Province	5,603	4,685	2,012	4,824
Ampara	21,347	3,721	871	10,298
Batticaloa	19,499	2,961	850	9,581
Trincomalee	3,635	2,872	884	3,378
Eastern Province	44,481	9,554	2,605	23,257
Jaffna	4,424	4,257	1,348	1,720
Mullaitivu	5,193	458	53	387
Killinochchi	611	393	143	0
Northern Province	10,228	5,108	1,544	2,107
Total	79,184	29,830	14,488	46,531

housing strategy where many different types of regional housing strategies may have been more appropriate for the diverse cultural, social, and ecological environments of the island. Researchers Catherine Brun and Ragnhild Lund assert the houses “were all based on a blueprint model with standardized costs and practicalities and not much developed in cooperation with the people [of a] particular area, grossly negating different understandings of what a house should be like, according to cultural practices and traditions.” (Blaikie, 2010)

Some of these issues are evident in the two case studies addressed later in this paper: a Muslim community in the Southern Province and a Hindu community in the Eastern Province. Both of these communities are ethnic minorities in Sri Lanka, and thus required specific considerations that are unique to these people. The relationship between the two projects was typical in terms of funding: the community in the Southern Province received significantly more funding and political sponsorship than that in the Eastern Province. Other examples of problems found in these two studies includes corruption, the buffer zone policy, and speed and quality of construction. However, the issue of the design of these two projects was perhaps the most pervasive and offers the most important lessons to be learned in this study.

### **Pre-Tsunami Condition in Sri Lanka**

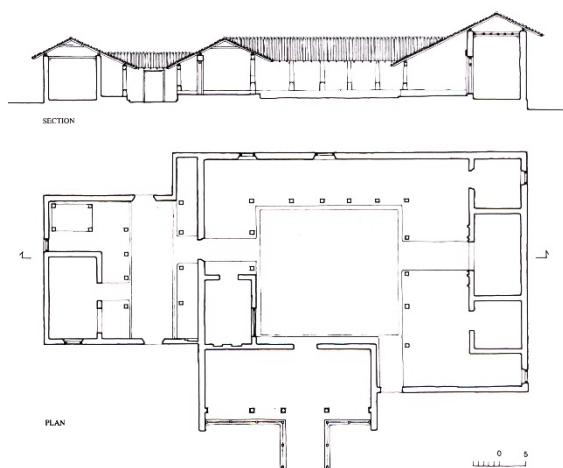
Before conducting an evaluation of the design of post-tsunami housing in Sri Lanka following the destruction by the tsunami, it is worthwhile to first attempt a basic understanding of the history and built environment of pre-tsunami Sri Lanka. The Sri Lankan cultural and architectural identity has been shaped by a number of historical eras and their lingering or pervasive influence can still be seen today. Traditional elements in Sri Lankan design can be traced to the Anuradhapura Period (377 BCE-1017), the Colonial Era (1815-1948), and the Modern Era with the influence of Geoffrey Bawa. The lasting influence of these historical eras are supplemented by the influence of Buddhism from India (introduced in third century BCE), Islam from Arab traders (seventh century AD), and climatic and physical limits imposed by the island itself.

Ancient Sri Lanka features iconic and original monuments which have been recognized on the world stage. The ancient capital, Anuradhapura, in the North Central province of Sri Lanka, is the most prominent example of early Sri Lankan architecture. The Jetavanaramaya is a stupa (a dome-shaped Buddhist shrine) of gigantic proportions located within this city. It has a diameter of 370 ft and was originally 400 ft tall making it the third largest building in the world at the time of its construction (Ranaweera, 2004). Buddhism is the predominant religion of Sri Lanka and therefore, stupas, as Buddhist monuments, are an important feature of the island’s ancient architecture. Another unique ancient architectural type of Sri Lanka is the cave temple. The Dambulla cave complex is a Buddhist monastery which originated in the third century BCE is still in use today. One notable feature of these caves is a drip ledge which was carved along the top edge of the ceiling and kept water from running into the cave. However, it is important to note that while these Buddhist monuments might be important in the architectural history of Sri Lanka as a whole, their significance is not as relevant in minority communities which occupy a large portion of the eastern coast which was devastated by the tsunami.<sup>4</sup>

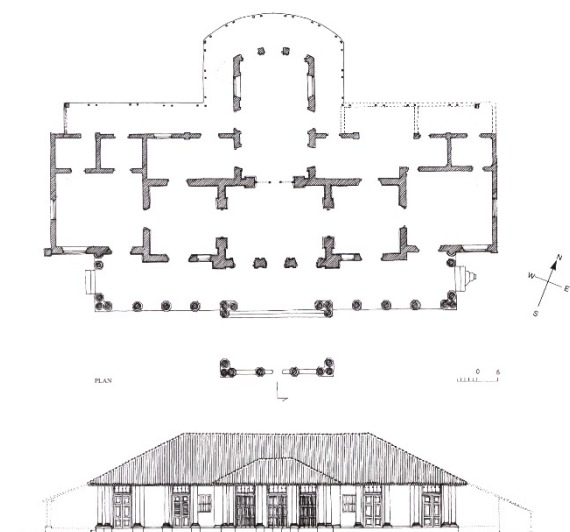
Sri Lanka was colonized several times (very briefly by the Portuguese, then by the Dutch, and finally by the British which was the most influential of the colonial eras). The Portuguese first arrived in Sri Lanka in 1505 and soon established a trading post in Colombo which possesses a natural harbor. Arab traders had been utilizing this port since the eighth century BCE and with the escalating fight for

control over this area beginning in the colonial era, Colombo's importance became more apparent and the city grew as a political and trade center for the entire island of Sri Lanka. In 1815, Colombo became the capital of the colonial British Sri Lanka. While the Portuguese and Dutch had primarily used Colombo as a strategic military fort, the British began constructing civilian structures around the city, increasing the political and social status of Colombo. Following the establishment of Sri Lanka as an independent nation, Colombo remained the political and economic center of Sri Lanka and came under Sinhalese rule. After many centuries under colonial rule the new Sinhalese government was eager to establish a distinct Sri Lankan identity. In 1956, Sinhala was established as the official language which antagonized the minorities of Sri Lanka, primarily the Tamils. These acts of discrimination by the Sinhalese dominated government eventually provoked the Tamil population into revolution and form the backbone of the issues which started the long conflict between the GoSL and the LTTE.

The British Colonial Era had the greatest impact on the architecture of the island. Portuguese and Dutch architecture was primarily confined to military forts on the coasts of Sri Lanka. British influence found its way into civil and residential architecture, as well, and was much more far reaching. Typical houses featured symmetrical plans absent of courtyards (which were prominent in older Sri Lankan domestic buildings) and entrance axis would often run the full length of the house and terminate with wide back doors. Large rooms opened off of this hall through double doors or wide arches. In urban areas, residential architecture underwent a change where open roofs within the interior were replaced by ceilings. The more prestigious houses of Sri Lanka during this time were typically larger one-storied buildings which reached into the landscape and were heavily ornamented. Individual plots of land guaranteed privacy and comfort in these homes. Religious architecture was dominated by the imported Gothic style and civic architecture often utilized the Renaissance and Neo-Classical styles. In



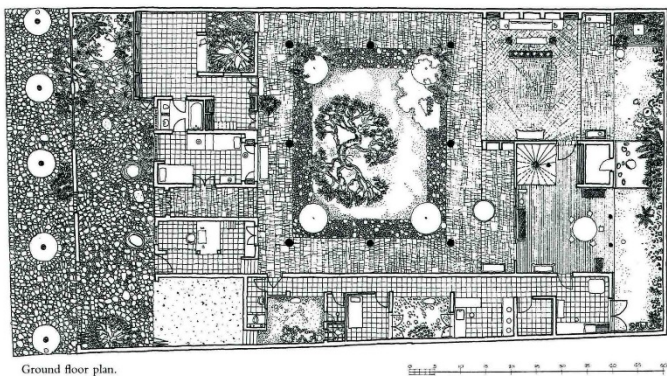
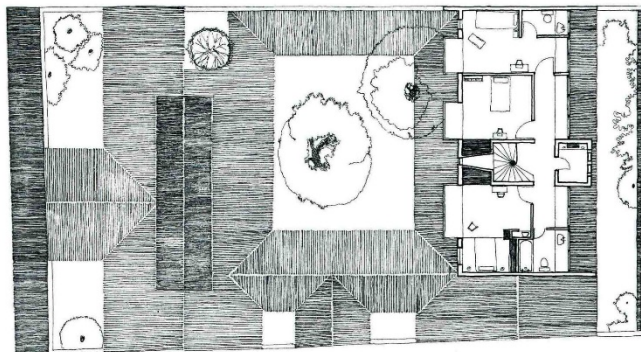
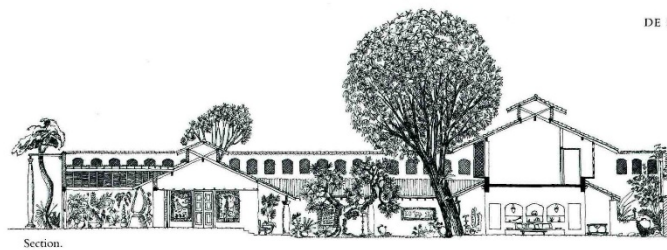
This plan and section of a Hindu house in Jaffna illustrate some of the features of typical Sri Lankan vernacular domestic buildings. The courtyard was a common element of these early houses. As a high caste Hindu residence, this house followed other compositional rules as well.



This plan and elevation are of a house built in the mid-1800s during the British Colonial Era and is a typical representation of fine house built during this era. The grand portico and axial alignment of the elements of the house are regular elements of British Colonial housing in Sri Lanka.

the British Era, colonial preferences began to usurp traditional elements in the realm of architecture. Traditional solutions for architecture were replaced by the “modern.” Sri Lanka was strongly influenced by colonial education and technology which was introduced at that time, such as industrial structural materials like rolled steel and reinforced concrete. Although colonial character and style was much copied, in certain instances when this character was no longer functional, there was a return to indigenous fashions such as the low, overhanging roof.

Geoffrey Bawa, a native of Sri Lanka who studied architecture in London, was indisputably the single most influential person on the architectural style of Sri Lanka. Bawa was born in Sri Lanka in 1919 and perfectly encapsulates the multi-ethnic culture of the island with his Arab, British, Dutch and Sinhalese lineage. His affinity for both Asian and European design sensibilities lead to the unique modern architectural style called tropical modernism which was “a new, vital – and yet essentially Sri Lankan – architecture.” (Robson, 2003) Tropical modernism fuses sensitivity for local contexts with the formal principles of modernism. One example of this fusion can be found in the way Bawa used the roof: after using the modernist flat roof in early designs, he decided to return to the pitched roof of Sri Lankan indigenous architecture conceding that it was better suited to the climate. Bawa continued to make design decisions which married modernist principles (open plans, formal clarity) with local context (adapting buildings to the landscape, using traditional architectural elements, allowing for natural



This house, designed by Geoffrey Bawa in 1959, shows how Bawa returned to vernacular sensibilities of early Sri Lankan houses while also incorporating modernist principles. In this project, Bawa deconstructs the house into a series of pavilions which are linked by the roof plane and the pathways which carve out the ground floor. The arrangement of the masses creates small gardens and courtyards which are sprinkled through the house. The Tropical Modernism style, which Bawa helped pioneer, favored the flat roof but Bawa soon began to utilize the overhanging pitched roofs which offered protection against the tropical sun and rain.

ventilation). Bawa revolutionized the way Sri Lankan residential, commercial, and social buildings were approached. In the 1960s, Sri Lanka's urban centers were growing rapidly and there was a need to rethink urban housing. Bawa sought a solution to this problem of by beginning to build vertically and returning to the courtyard style house (which was less common in the British colonial period). In many of Bawa's residential designs, the roof joins several different elements of the house together with open air courts situated between the massed elements of the house. These elements may be staggered but are always arranged in a way that creates a continuous flow of space on the ground floor while defining a courtyard space within that house.

The climate and topography of the island have also influenced the style of vernacular architecture. Site selection is a critical issue for the island. In the past, poor consideration of site and ill-suited foundations have led to drainage issues on the island. Bawa's introduction of creating site-specific architecture (fitting a building to the landscape rather than forcing the land to fit the building) was a revolutionary idea at the time. Following the destruction by the tsunami, site selection became an increasingly important issue, as the scarcity of land increased with the demand for land due to the implementation of the buffer zone. Material selection for buildings was also an important issue. Regulations on imports for building materials should reinforce the beneficial ideas of using local materials and labor. However, deforestation has become a problem on the island with less than 30% of the island now being covered in forest. Non-renewable materials such as river sand and coral lime (used for brick and tile production) are rapidly disappearing too. This presents a challenge of using local materials but in a creative way as to not deplete the island of its natural resources. Local materials used in contemporary architecture include offshore sand and dolomite lime, wattle and daub, sun-dried bricks, mud and stone walls, and thatch, straw and tiles for roofing. Sri Lanka receives approximately 250-300 clear sunny days and therefore the potential for day lighting is unusually high. The warm climate also calls for natural ventilation. Both day lighting and natural ventilation are on the rise in the housing sector in Sri Lanka, perhaps again thanks to the initiations of Bawa's forward thinking designs across the country and region.

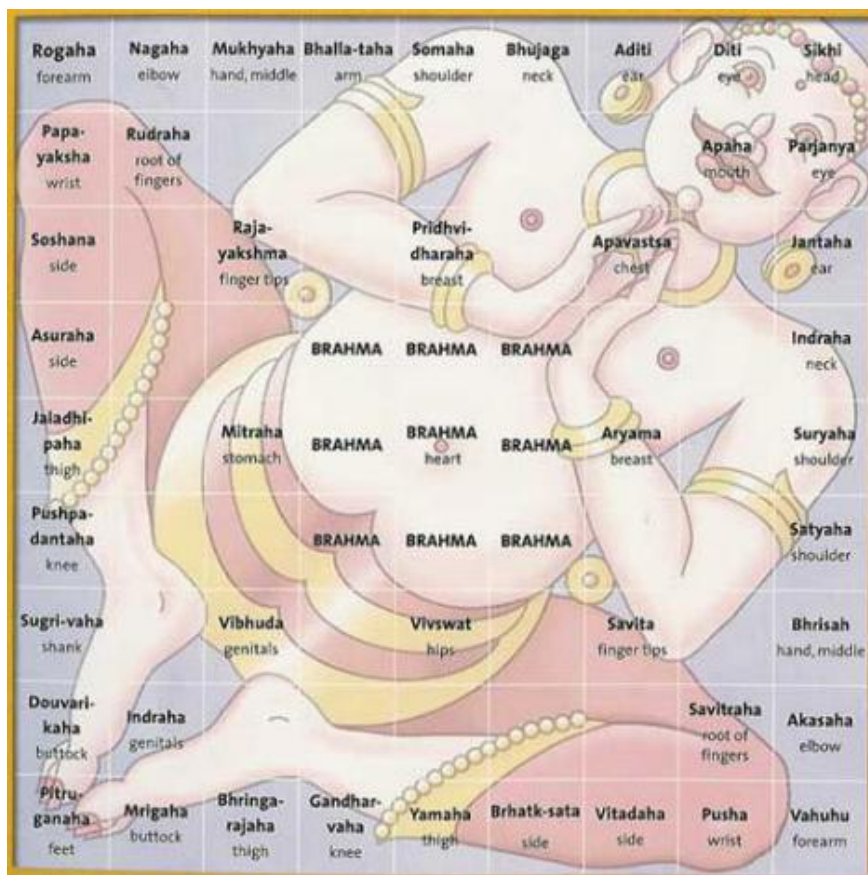
The multi-ethnicity makeup of the island means that approaches must be locally influenced. There is not a single overarching solution for rebuilding communities in Sri Lanka. The Buddhist population is the largest in Sri Lanka; however, many of the areas that were hit worst by the tsunami were Muslim or Hindu communities. A failure to understand this cultural distinction can be seen from the relief efforts when used clothes were donated to victims but these clothes were essentially unusable due to their revealing nature. In Hindu communities, the Vastu Shastra sets forth a design system which is widely observed. This text sets forth various codes for building: kitchens should not be in the northeast because this would trigger dissent and reduce harmony within the family; wells should not be to the southwest of the house as this would lead to disagreements between parents and their son; main doors should not directly face rear exits because this would encourage wealth and happiness to leave quickly rather than circulating through the house. These few examples show the necessity of consulting with local communities to gain an understanding of specific cultural practices that could influence the design of homes and settlements.

The political state of pre-tsunami Sri Lanka was one of turmoil with the Government of Sri Lanka engaged in a civil war with the Liberation Tigers of Tamil Eelam. Many war refugees were left without a home or land and were forced to live in temporary shelters along the northern and western coast of Sri Lanka. As a result of this, many of the people affected by the tsunami were already in a vulnerable situation to begin with. A 2005 survey shows that about 53 percent of the houses destroyed by the

tsunami were less than 450 sq ft (500 sq ft is the minimum floor area of houses constructed through Donor-Driven Programs). About 32 percent used cadjan or metal sheet roofs and almost half used materials which were unsuitable for wall construction. The survey also showed that there was a significant portion of people (22 percent) who did not own the land on which their homes were built. (Jayasuriya, 2010)

There is an ongoing discussion about the necessity to “build back better.” The vulnerable state of the affected communities before the tsunami implies that this may be the obvious course of action. However, build back better strategies require more time and resources. International attention does not typically last long enough to cover rehabilitation activities much less a build back better initiative, therefore, much of the responsibility of rebuilding these communities falls on the government and local communities (which in this case are already crippled by the natural disaster and civil war). After a disaster, speed is important and victims will want to be resettled as quickly as possible. However, studies also show that the joy of being resettled can quickly be overcome by a depression brought about by the subpar quality of their built environment. Different methods of rebuilding can be seen all throughout Sri Lanka, some focusing on build back better strategies with emphasis on quality and some focusing on restoring the status quo with an emphasis on speed.

Whether “build back better” was achieved or not in post-tsunami Sri Lanka must be determined case by case. As previously mentioned, the quality and speed of construction as well as the level of satisfaction within the communities varies widely and was influenced by a number variables. The next portion of this paper, looks at specific examples of housing reconstruction strategies. One example focuses on a community of Hindus in the Eastern Province of Sri Lanka which faced a very different set



The principles of Vastu Shastra outline a highly organized plan of Hindu structures where the body is treated as an analogy for elements of the house. Other rules for building and construction accompany this illustration as well.

of challenges than the other example, a Muslim community in the Southern Province. Important lessons can be drawn from both precedents and hopefully by understanding the issues involved in these two studies, problems may be avoided (or at the least anticipated) in future disaster rehousing strategies.

### **Housing for Tamil Hindus in Eastern Sri Lanka**

One of the many NGOs to mobilize in Sri Lanka following the 2004 Indian Ocean Tsunami was the Smart Shelter Foundation. The Smart Shelter Foundation is a non-profit organization which aims to empower individuals in developing countries by providing them with knowledge of building technologies so that they may improve their living conditions. The organization works to provide safe and affordable housing in developing countries and even provides on-site training to local construction workers. One of the main focuses of the group is to create resilient housing, which is resistant to natural disasters.

Martijn Schildkamp founded the Smart Shelter Foundation in 2005 and its first major project was post-tsunami housing in Sri Lanka. In September 2005, the Smart Shelter Foundation was hired by a Canadian NGO to design new houses for tsunami victims in the district of Batticaloa in Eastern Province Sri Lanka. In the next eight months, 170 houses were constructed in the villages of Kurukkalmadam and Mankadu under the supervision of the Smart Shelter Foundation. Schildkamp's experiences in Sri Lanka provided him with useful knowledge that would be applicable in future projects around the world and helped him formulate his goals for the Foundation which have a few key distinctions as compared to the stated goals of other NGOs involved in rehabilitation of communities stricken by natural disaster.

One of the first things which Schildkamp observed upon arriving in Sri Lanka in 2005, is the overwhelming number of actors involved in rehabilitation. There were so many organizations that each one was edging out the next. The International NGOs and different agencies of the United Nations were particularly pushy, taking over projects and poaching staff from local NGOs. This is unfortunate since it was the local NGOs that have the best chance of developing a comprehensive understanding of the current condition and designing an appropriate response. It would have been more productive and worthwhile for the International NGOs with a large amount of resources to support the local NGOs by offering their help to them rather than undermining their efforts.

Another immediate observation was that the temporary houses that were designed were typically larger and of higher quality of construction than the original houses which were destroyed. This created a lot of tension between those living in the "tsunami zone" (the area that the tsunami directly affected) and those who were just beyond. Those that were not in the tsunami zone still felt like they were entitled to a home and Schildkamp was approached by families who asked for a new house but did not qualify for tsunami aid. "They would try to trick you," Schildkamp recalls. Those that did not qualify for aid still tried to find a way to elicit help from the NGOs. When asked why she was not on the list to receive aid, one woman responded, "I could not pay the bribe to the mayor." People in this region were desperate for help and it seemed that local officials would often take advantage of this by asking for bribes in exchange for adding people to the list of those who received tsunami aid.

The Smart Shelter Foundation was eventually assigned the project of building twenty houses for a community of Tamil Hindus in Kurukkalmadam. Before the tsunami, this community was living within the buffer zone so they were required to relocate farther from the sea. A plot of land was assigned to the community and Schildkamp began working on the design of these twenty houses. Consideration was given to the housing building requirements laid out by the GoSL and the locals' preference. The Smart Shelter Foundation held meetings with the community so that the people could react to the

designs and have direct input into the final design. At one of these meetings a final proposal was voted upon by the villagers and approved.

This final design was a rectangular house roughly twenty-seven feet by eighteen feet with a total floor area of 502 sq. ft. A central living space ran through the middle of the house from the front door to to a back porch. This porch was inset in the house by about five feet so that the roof provided shading. The kitchen could only be accessed by going out on this porch (even though there was space enough to insert a door which directly linked the kitchen and the living space). Schildkamp was very deliberate about this placement, and said that this created a situation where the woman responsible for cooking had no choice but to go outside to get to the kitchen. This ensured that she would not be shut inside the house all day and would have at least some contact with the outside world, even if it was only the journey to and from the kitchen.

Another series of doors that were placed very intentionally in this design were the front and back doors on opposite ends of the living room. To the foreign eye, the initial expectation might be that these doors should be lined up directly across from one another. This would allow for a cross breeze to easily flow through the house to help with passive cooling (an important feature in the hot climate). This would also match the design of historical housing on the island from the not-so-distant British Colonial Era. As mentioned earlier in this paper, it was very common in British colonial houses to have a narrow hall which was capped by the front doors on one end and the back doors on the other. Many post-tsunami houses were probably constructed this way (such as the Kirinda houses designed by Shigeru Ban). However, in Hindu communities, such as this community in Kurukkalmadam, this is an inappropriate response. The villagers believed that by aligning the doors in this way you are allowing ghosts access to walk straight through the house. By offsetting the doors, you confuse the ghosts and they will no longer try to enter the house.

The Hindu communities located along the northern and eastern coasts of Sri Lanka have a number of beliefs such as those, which should have been considered when designing post-tsunami housing in these communities. The ancient text of the Vastu-Shastra (translated as the “science of architecture”), is a Hindu guide to architecture. The GoSL, primarily dominated by Sinhalese Buddhists,



This is the final plan as approved by the Divisional Secretary. The plan featured a living space, two bed rooms, a kitchen (connected to the living space by an outdoor porch), and a bathroom (which became a storage space when the toilets were moved to a latrine pit some ways away from the house).

would not recognize or promote sensitivity to these principles in regulations for the national building rules and many NGOs were ignorant of the religion of the people they were designing for and its impact on housing design. Even when foreign NGOs attempted to design specifically for a Hindu community, the rules outlined in the Vastu-Shastra are so complex and numerous, that it would be very difficult to implement them in a way that felt truly correct to a local of that Hindu community. The Vastu-Shastra divides a house into sixteen parts and dictates the location of those elements. However, in post-tsunami housing, the affected families were poor and wouldn't have been able to create a house with all of these elements anyway. It then comes a matter of interpretation of how to follow these guidelines to the best of one's ability when these certain elements are missing. This interpretation should be left to the affected locals who would be living in this house (not the foreign NGO who thinks they might know best). Other rules which are laid out by the Vastu-Shastra include: while building foundations, construction should be started from the south-west direction; mirrors should never be fixed on south or west walls if possible; while sleeping, the head should be in the south or west but never in the north; all rain water should flow from the south to north and west to east only. These are only a few of the many guidelines that are laid out by the ancient Hindu text, and these few examples start to give an impression of how difficult it would be for a foreign designer to interpret and apply all of these rules in post-tsunami Hindu communities in Sri Lanka.

Schildkamp's design, in addition to the living room, porch and kitchen, featured a bathroom which opened to the outside. The toilet was later removed from this room and was instead located at a latrine pit some way from the house. In Sri Lanka, this is a typical response. Having the toilet located under the roof of the house was undesirable. What had been designed to be a bathroom, thus became storage. The design of the house also had two bed-rooms located on either side of the living room. One larger bedroom was for the parents and one smaller bedroom was for the children. The community approved these plans and the housing design was finalized. Each house ended up costing 5,000 USD (half that was provided by the Smart Shelter Foundation and half by the GoSL as laid out in the Donor-Driven Program).

The designs were complete and a contractor was found for the project, however, construction could not begin without the government's approval. This approval had many channels to go through in the GoSL and would take six to eight months. After explaining to the Divisional Secretary how the organization could be ready for construction in two weeks if they did not have to wait for this approval, the Smart Shelter Foundation's drawings were stamped and the organization was given permission to start building immediately (technically bypassing the regulations involved in this approval process). Other projects were delayed considerably waiting for the administrative go-ahead. The NGOs responsible for the projects were often criticized for these delays by the GoSL and the GoSL was criticized by the NGOs for delaying construction with arbitrary policies and red tape. However, the projects which were fast-tracked (such as the Smart Shelter Foundation's work in Kurukkalmadam) also upset people because they claimed construction was proceeding too quickly and that there wasn't enough man power to accurately track the changes to ensure accountability.

After finally obtaining permission from the GoSL, the Smart Shelter Foundation was ready to begin construction on the twenty houses in Kurukkalmadam. The Smart Shelter Foundation asked for the villagers to participate in the construction of the houses by helping with unskilled labor tasks such as filling in the foundation and painting. Surprisingly though, only one out of the twenty families agreed to work on the houses when the time came. The other families began asking about their wages for working on their houses. World Vision offered to pay anyone who worked on construction of their projects. As a result, the villagers of Kurukkalmadam went to work on projects for this organization rather than work on the construction of their own houses. Schildkamp stated that this was devastating to the process because now the villagers were no longer invested in their homes and instead preferred to work on other people's homes in exchange for money.

As construction progressed, problems began to arise in the quality of construction. With more people beginning construction on their projects, the block factories could not meet the demand and started producing poor quality building blocks. One day, during construction of the walls, Schildkamp noticed that the colors of the walls changed about half way up and upon closer inspection found that the new blocks were of a poor quality and had to be torn down and replaced. The contractor then got mad at Schildkamp. His goal was to complete projects as fast as possible but Schildkamp recognized the instability of the blocks which would threaten the structural integrity of the house and knew it was necessary to rework that section of wall. Other mistakes began to pile up: splits in the wooden beams supporting the roof; uneven spacing of joists; gaps in the walls or doors. The contractor rushed to patch up all of these problems that kept springing up. Because the villagers were not directly involved in the construction, those who were invested in the houses the most had no control over the quality of materials or construction of the houses. The only priority of the contractor in charge of construction was to complete the projects as quickly as possible so that he could move on to the other tsunami-housing projects he had taken on.

Finally construction was complete and the villagers began moving into their houses but sadly the problems were not over. Now, a design flaw emerged. Despite the fact that the house had been designed with two bedrooms, the entire family moved into only one of these bedrooms. Instead of



One of the bedrooms was converted into a temple. Unfortunately, this meant that the entire family had to share one bedroom.

housing the children in the smaller bedroom, that room was converted into a temple. Schildkamp voiced his frustration; this design was approved by the villagers and he had created an extra bedroom so that the family could have more space and not have to share a single room. The villagers responded by saying that they required a temple within their house though and this was the only space for it. This did not come out during the community meetings in which they discussed the design of the houses however. They believed that the foreign, educated architect knew exactly what to do and they didn't realize they needed to tell him about this.

Another issue that arose after construction was complete was the lack of a fence for the community. Because of the on-going conflict, fences were being placed around certain communities so that the villagers could feel safer. The Smart Shelter Foundation did not provide a fence for the villagers of Kurukkalmadam and the issue did not come up at the community meetings. However, some of the other NGOs in the area had different budgets and were able to construct fences around the houses they constructed. This angered the villagers who did not receive a fence. Within the Donor-Built Program, houses were being constructed on vastly different budgets, with different designs and quality of construction and this led to a lot of tension among the aid recipients.

The Smart Shelter Foundation was also involved with quality control within the Owner-Driven Program. The organization was able to supervise the construction of 150 houses in the same area. The owners were completely responsible for designing the house, buying the building materials and hiring labor for construction and were therefore able to move much quicker and create designs that were much more relevant to their specific situation. The housing owners knew exactly what they wanted in a home and therefore personal designs worked better. For example one family created a two storied house with a living room downstairs and bedrooms above because the children were afraid of the water. Responsibility for these houses lay with the owner and therefore owner participation was vital to the successful implementation of the house. Since they were responsible for their own materials, there was a certain level of innovation in producing these materials. When materials became scarce, many people dug holes in their backyards and used the sand to mix with concrete. The salt in this sand creates salt crystals in the mortar but this is only an aesthetic problem and not a strength problem.



This house was designed and built by its owner to fit their specific needs. The children wanted bedrooms on top of the house because they were afraid of rising water. While not directly involved in the design of these homes, the Smart Shelter Foundation supervised the quality of construction and building techniques.

Schildkamp's only responsibility for these 150 houses was supervising and quality control: ensuring that walls are truly vertical, assessing structural strength of designs, testing strengths of materials.

Based on his experience in Sri Lanka, Schildkamp believes that Donor-Driven approach to rehousing disaster victims is ineffectual. In general, that process does not produce enough results based on the amount of time, money, and effort given. In addition, when foreign donors come into affected areas and attempt to design for communities of which they have no previous knowledge, design errors inevitably occur. These programs also do not allow for proper participation of the aid recipients. The competing rush of these organizations to complete projects also indirectly leads to other problems such as low quality of construction. By contrast the Owner-Driven approach was much more successful because the aid recipients were in control of their future and empowered by foreign aid rather than undermined.

### Housing for Muslims in Southern Sri Lanka

Following the 2004 Indian Ocean Tsunami, entrepreneur Phillip Bay founded an organization to assist with tsunami reconstruction. His organization, Colliers Internationals, was prompted by the GoSL to take on a small Muslim fishing community in Kirinda, located in the Southern Province of Sri Lanka. Bay asked architect Shigeru Ban (known for his disaster housing designs) to be the architect for the project. Ban's reputation for this type of housing project (Kobe in 1995, Rwanda in 1999, Turkey in 2000, India in 2001) was such that immediately following the tsunami, he received three different requests for design from India, Indonesia and Sri Lanka. Ultimately, Ban decided to take on the Bay's proposal to reconstruct 100 houses in Kirinda and said he choose the project because the objective "was clear; it was for a smaller community and a minority group in a more difficult situation." (Samath, 2005)

The Kirinda project was located only 300 km from Colombo and received a great deal of attention. It had the support of certain political leaders, such as the current Prime Minister and future President of Sri Lanka, Mahinda Rajapakse. In 2013, this project was put on the shortlist for the Aga Khan Award, thus receiving international recognition for its design. However, despite all the praise it received, this project had its problems as well. The most obvious was that it embodied all issues of inequality between the Southern and Eastern Provinces. This project received special attention that was



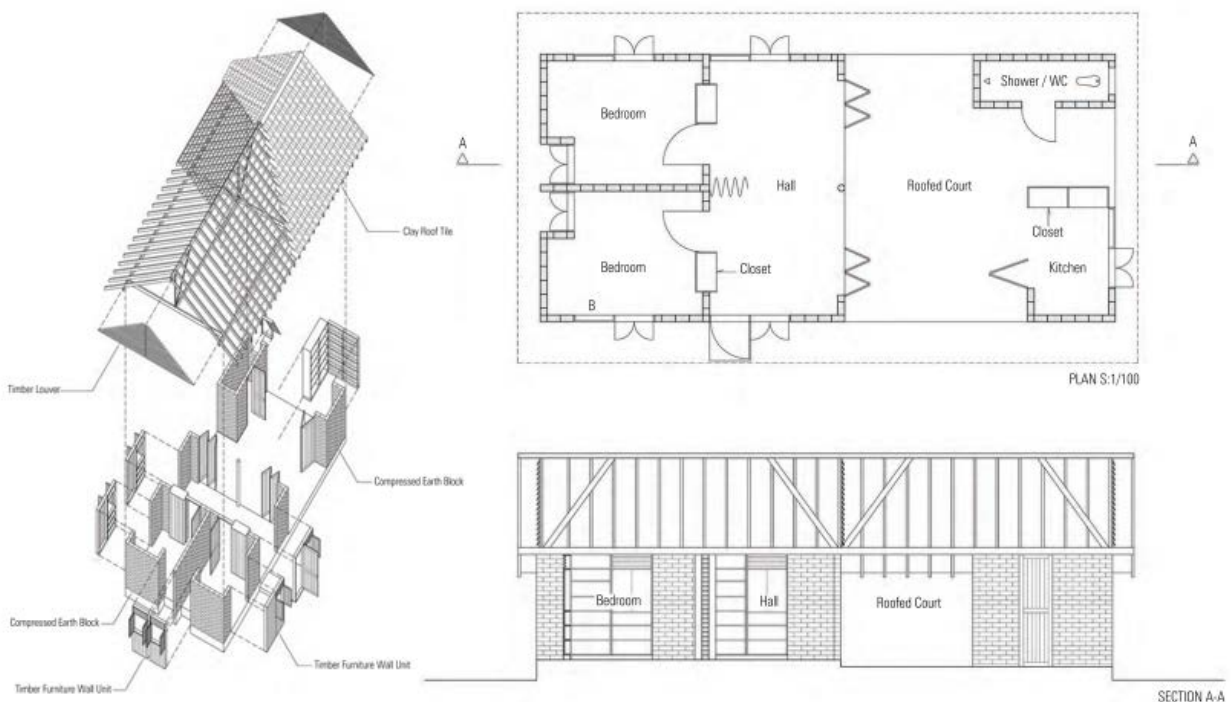
This site plan shows the Kirinda community and its proximity to the ocean. The mosque is also feature in this plan although it has not been completed yet.

common to the Southern Province but unheard of in the Eastern Province. The initial budget for this project 1,000,000 USD or 10,000 USD per house (twice that of the Kurukkalmadam houses designed by the Smart Shelter Foundation). However, the plan to build 100 houses was never realized. Only sixty-seven houses were completed but the budget was roughly the same and so the cost per house was about 15,000 USD (three times that of the Kurukkalmadam houses).

One unique feature of this project was that the recipients were allowed to rebuild on their existing plots of land rather than relocate farther from the shore. This helped contribute to the maintenance of the social fabric of Kirinda. This also allows the fishermen and divers to continue working in the same location (the Kirinda harbor is located only 200 meters from the site). The stable provision of these livelihoods helps the families as well as the traditional local economy within this community.

Ban visited Sri Lanka in February of 2005. Because he had never designed for a Muslim community, he wanted to hear design requests directly from the villagers. From these meetings, Ban realized three important principles that applied specifically to this community: 1) according to the Muslim lifestyle, men and women required separate spaces; 2) the fishermen and divers required space to be secured for their tools and compressors; 3) villagers wanted a plan where wet spaces (toilets, shower and kitchen) are contained within the main building. (This is different from the community in Kurukkalmadam which specifically asked for the toilets to be located away from the house and proves that this is an issue which must be addressed according to a specific community.) The GoSL technically required the wet spaces to be located outside of the house. Ban then had to address the challenge of satisfying both the community and the GoSL.

Ban's solution to this problem was to create a roofed court. This allowed the kitchen and bathroom to be contained under the same roof while technically separating them from the "house", which he considered to be the bedrooms and living spaces. This space also allows for natural ventilation to flow through the rest of the house and provides a shaded space which is by the family for socializing



with friends and neighbors, enjoying meals, and repairing fishing nets or other equipment. Ban studied local Sri Lankan architecture and said that his design of the house, particularly the roofed court, was inspired by Jeffrey Bawa's architecture. The court is directly adjacent to a hall and the two spaces can be joined or separated with folding partitions. The hall can also be divided in half with another folding partition which runs perpendicular to the other two. This creates a plan which is open and flexible but also allows for spaces to be segmented in order to create privacy for the women, which is required in certain situations. Two separate bedrooms join to the hall.

The size of the house was predetermined in order to guarantee sufficient natural ventilation. The roofed court, along with keeping the house small, ensured that air could easily flow through the building. The upper parts of the wall at the gabled ends of the house were slatted to allow for cross-circulation of air. Upon completion, however, it was found that these openings allowed a lot of dust to enter the house and rain to enter the bedrooms. Many residents decided to cover these slats with cardboard or plastic sheeting. Some residents also decided to build concrete-block walls to enclose the open court space, claiming that this enclosure made the house cooler (despite the fact that the open court was in fact designed to cool the house with natural ventilation).

There may have been another reason for enclosing the open air court however. The inclusion of the bathroom and kitchen within the house (but on the other side of the court from the bedrooms and hall) meant that if guests were present, the women (who could not be seen by guests) could not use the kitchen or the bathroom. In the past, the bathroom and kitchen area was located outside and this allowed for discrete use by women who were trying to avoid being seen. Ban's design intended for the folding doors to provide this separation while still creating a sense of inclusion. However, many of the housing recipients did not feel that they were consulted adequately during the meetings Ban held with the villagers and therefore were unable to voice their concerns with the design. This shows how the conceptualization of the project differed between the architect and the recipients. Ban saw the design as two "houses" joined by the court which would satisfy the needs of the recipients. However, many of the recipients felt that they had been given a single house which was bisected by the court and isolated the elements of the house so that one was inaccessible to the other by the women of the family. The problem of the open court is accentuated by the fact that many of these houses are lined up so that open courts of the adjacent houses are visible on either side. Which means every house in



This photo of the interior of the Kirinda house shows the open court in use by the family. The folding wooden partitions are also visible as well as the slatted wall near the roof and part of the roof structure.

the row must be void of strangers in order for the open court to be utilized by the women.

Great thought was given to the selection of materials for the houses. The hope was to use materials that were available and cheap and could be assembled quickly. The walls were constructed using compressed earth blocks (CEB) joined by cement. These blocks are made from a mixture of clay and cement which were readily available in Sri Lanka. The blocks were shaped with uneven surfaces which can be interlocked in a similar manner to LEGO blocks. Because of this interlocking, the construction of the house is very easy and can be accomplished by untrained laborers (instead of by masons which were usually required) which would allow the villagers to get directly involved in the construction. However, when making additions to the houses later, the housing recipients utilized concrete blocks instead of the CEBs which were featured in the original design. The fact that the villagers opted to not use this material either indicates that the construction skills were not in fact passed on or that the CEBs proved unsuitable for the local building economy.

Another building material used on this project which is more unique was wood from rubber trees. This is not a typical architectural material, however because of the explosion of the tire industry in Sri Lanka, the island is covered with these trees and they serve as a good alternative to more traditional lumbers which the island has had a shortage of for a long time. The rubber tree wood was used for the partitions and the permanent furniture fixtures. Ban designed these furniture units so that they could be prefabricated and quickly installed on site in order to save on construction costs and control quality. However, this could be considered a missed opportunity. Each of the houses Ban created in Kirinda are identical, but the furniture fixtures would have been a great chance to introduce a little variety and customization into the houses. For example, each family could have had the opportunity to have some input on the design of their specific shelving units based off of their belongings that they would want to display. The prefabrication off site also robs the community of a chance to participate in the construction process, where they could possibly have learned a new skill which would contribute to livelihood growth. However, the furniture units which were built have been well used by the residents and appear to be satisfactory.



The compressed earth blocks allowed for quick and easy construction and did not require a trained labor force. This image illustrates how the blocks can easily be interlocked.

The materials and the construction methods were chosen specifically to increase the speed of construction and lower costs. Ironically however, this project ended up being slower than that of projects constructed by other NGOs (which were already notoriously slow). Although the project was commissioned in 2004, design work did not begin until 2005 and the project was not completed until 2007. And, as stated earlier, this project ended up costing almost four times as much as other projects produce by other NGOs. Two model homes were completed by September 2005, but frustrations arose later on when it was discovered that not all of the homes followed the design of these models.

Another problem which might arise from the housing design is the vulnerability of the wooden partitions. One of the main needs of the Muslim community was to ensure privacy for women. This is accomplished only with the wooden partitions. However, if over time, the partitions break or fail, this privacy is lost and the only space reserved for the women would be the back bedroom. Therefore, the genius of the design is only temporary because these partitions will eventually, inevitably break. It would then be the responsibility of the house owner to create new partitions which would more than likely be of a lower quality than the original partitions.

While the wooden partitions might not age well, the structure of the house has been called “robust”. (Barakat, 2013) The CEB walls are sufficiently strong. The structure of the roof of the house was comprised of timber trusses and was topped by clay tiles. The central pillar which supports the roof trusses was made up coconut wood. This wood was specifically chosen because of its apparent strength. The roof trusses are secured to the walls and can stand up to high winds and earthquakes. After moving into their new house, the family was given a grant of 400 USD to supplement the furniture units which were built into the house. However, some families claimed they were initially promised a greater sum for this project and some said they received no furniture grant at all. This ended up causing a lot of dissent among the different recipients and many felt they were being treated unfairly. Some residents which received this grant, refused to use it for new furniture and instead used the money to make adaptations to their houses. This highlights a problem which was alluded to earlier: a single housing model is not sufficient to satisfy the unique needs of each recipient family. Many of the recipients expressed frustrations at not being able to have more input into the design of their house. The fact that many of the beneficiaries made changes to their homes shows at least a small level of dissatisfaction with the basic design.



This image shows one of the adaptations made to a Kirinda house. A wall was sometimes added to the open air court to create more privacy. In this case two houses were adjacent to each other and the open air courts of each would have felt too open to the residents.

However, Ban addressed one aspect of community development which many NGOs missed: landscape. In addition to destroying the built environment, the tsunami also destroyed much of the natural environment. Trees were ripped up and washed out to sea by the powerful waves. In Kirinda, trees were an important part of the fishing community culture. Sri Lanka can be very hot and sunny and the shade of the trees was a great amenity. Fishermen would do repair work or have lunch under the shade of these trees. In addition to building houses, Ban ensured that 200 trees were planted around the community. These trees were planted by Japanese students from Ban's school and by students who were studying landscaping at the University of Moratuwa in Colombo. Shitanee Ivonne Balasuna, a professor at the university was chosen as the landscape architect for the project. This project illustrates a level of thoughtfulness involved in the landscaping which was lost in many projects carried out by other NGOs. Studying other post-tsunami projects reveals that many NGOs simply provided rows of houses on dirt plots with no greenery in sight. Three small lakes which were present on the Kirinda site also received drainage systems to mitigate the risk of floods during the rainy season.

The Kirinda housing project was unique and innovative with a high quality of construction. The housing design fused local sensitivities with design elements inspired by modern Sri Lankan architecture. The houses received a great deal of praise for the most part on a national and international level. A study done in 2013 confirms that all of the houses are still occupied and well maintained which demonstrates a commitment on the part of the inhabitants to their community and a general satisfaction with the house itself. Ban was approached by many locals who were not affected by the tsunami who liked his design so much they asked him to tear down their unaffected houses in order to create one of his post-tsunami houses. The locals appreciated Ban's designs so much that they asked him to also design the village's new mosque (not yet complete).

However, there were also problems with the scheme which should not be overlooked. The time and cost of the project was much greater than it should have been and since the mission statement for this project was specifically aimed at creating a cheaper housing prototype at a faster rate, this is a significant fault. Relative to other projects on the island, this Kirinda houses were not successful in delivering a quick and inexpensive housing solution. While quality is an important feature of disaster housing which is often over looked, the main goal of disaster reconstruction should be to rehouse victims as quickly as possible so that they can move past the tragedy of the disaster and not fall victim to a second shock, which is caused by being forced to live in unsuitable conditions indefinitely.

## **Lessons Learned**

The studies of rebuilding the communities of Kurukkalmadam and Kirinda reveal similar problems. However, the solutions to these similar problems are elusive and unique which proves there is not a single overarching answer to the question of rebuilding after a disaster. Both communities required specific approaches which are specific to time, place and people. Before finding the answer to how to rebuild in these communities, it is important to highlight the problems. The approaches which were exercised in these two case studies both had design flaws, administrative issues, cultural misunderstandings and implementation issues (Table 1).

Both of these projects were carried out under the Donor-Driven Program, in which a donor works together with the government to construct houses for an assigned recipient. The recipient has little control or influence in this process. Many of the problems which have been highlighted from the Kurukkalmadam and Kirinda case studies also manifested in other projects within the Donor-Driven

Table 1: Problems with rebuilding in Kurukkalmadam and Kirinda

	Kurukkalmadam	Kirinda
<b>Design Flaws</b>	Toilet placed inside the house	Open roofed court destroyed illusion of privacy  Slats under gable let in too much dust  Many families wished the kitchen was completely separate from the house
<b>Administrative Issues</b>	Unequal aid distribution (this project received a third of the funds per house than the Kirinda community)  Governmental red tape slowed construction  Evidence of corruption	Unequal aid distribution (this project received three times the funds per house than the Kurukkalmadam community)  Unequal distribution of grants for furniture
<b>Cultural Misunderstandings</b>	Design flaws were not caught during community meetings  A temple was not included within the house  Villagers expected a fence	Villagers felt they were not appropriately consulted  Donor and recipient understand “privacy” differently
<b>Implementation</b>	Villagers were expected to work on the construction of homes but instead sought other work  Contractor neglected quality of materials and construction (inadequate building blocks and structural wooden beams)	Only 65 houses were built instead of the 100 that were initially planned for  Slow construction

Program. The Owner-Driven Program, by contrast, saw a greater degree of success: projects were completed faster, the aid recipients were empowered, and the design of the houses was more relevant to a specific place and people. These successes are due to the collaborative nature of the program, in which donors (with funds and technical skills and knowledge) are connected with aid recipients (with specific cultural knowledge) who are now allowed to actively participate in their rehabilitation. The recipients are able to pursue solutions specific to their needs and given the opportunity to take charge of their future again. The donors are able to support these recipients by providing funds and resources and monitoring the construction which is undertaken by the recipient or home owner. An appropriate donor can ensure that the reconstruction of the house is adequately strong in order to withstand future natural disasters. This approach to rebuilding after natural disasters should be explored more to refine this type of partnership between donor and aid recipient.

## **Conclusions**

In recent years, disaster reconstruction has received a lot of attention. The annual turnover in 2010 for the International Development and Aid Industry was 120 billion USD. It has been tagged the “fifth world economy” and this number is expected to grow to over 150 billion USD. The estimated efficiency of this industry is placed between ten and fifteen percent. Money is wasted on mismanagement as a result of insufficient knowledge of aid required and a large portion of it simply “disappears”.

The number of NGOs is also growing uncontrollably and many untrained workers in this industry are causing more problems than they are solving. They assume they understand the situation of the affected community instead of identifying the true needs. Instead of assisting and empowering the people, they dictate and overpower creating a dependent community which (through foreign interference) now loses its identity in addition to the devastation it already suffered in the disaster. Too many active organizations do not even realize the negative impact they are having upon the affected community.

The organizations which act within the International Development and Aid Industry should be accountable to those they are serving and not just themselves. Regulations should be placed on these organizations to ensure only those who are properly trained are working in disaster-reconstruction. The incredible amount of funds disappearing into this industry is also unacceptable. Organizations should keep better track of funds and provide more transparency to both donors and the aid recipients to ensure that in the rush to help communities, money is not being unnecessarily thrown away or lost. Reports produced by these organizations should also be more legible to a wider community so that the problems and issues associated with International Development and Aid can receive more attention.

Increased accountability and transparency, however, would still not be enough to quell the inefficiency of these organizations. There is simply too much activity happening. In Sri Lanka, the absorption capacity of the GoSL was a huge limiting factor. Managing that many organizations and that much money was simply too much for the small island nation. Upon reflection, it has been determined that “the same amount of work could have been done with a third of the expats, half of the organizations and half of the money.” Despite the fact that most of those in the International Development and Aid Industry agree with that statement, there has been even greater growth within the industry and many of these new organizations have insufficient knowledge and experience in the field they are working in.

The Smart Shelter Foundation, based on the lessons they have learned from their involvement in developing countries, has laid out a few rules which are vital to their methodology and would be useful for all NGOs working in disaster reconstruction. The most important rule is that “The initiative for a project has to come from the people and not from us [the Smart Shelter Foundation]. They know best about the situation in their village or area, and they must tell us about their real needs.” One of the biggest problems (if not the biggest problem) with humanitarian architectural work in developing countries, is that the designer or architect assumes that they know best. People working within this field have proven to be very opinionated, creative—perhaps—but also ignorant when it comes to designing for those in need from another culture. They can be so eager to pursue their own goals that they fail to try to understand the needs of those that they are designing for. Even in cases when great care is taken to attempt to listen to the needs of the aid recipient, cultural and linguistic barriers can keep a complete understanding from being reached. The local people cannot possibly be expected to communicate every far-reaching issue imbedded in their unique and complicated housing culture.

It could be argued that such a complete understanding is impossible to reach for one who has not been imbedded in the recipient culture for an extended period of time. However, many within the International Development and Aid Industry refuse to acknowledge the fact that they simply are not qualified to do what they have been doing for years: designing for a culture with which they have no experience. Martijn Schildkamp, an architect and founder of the Smart Shelter Foundation, equates this kind of work with an inexperienced civilian attempting open-heart surgery on a patient half a world away. “This approach does not work,” he says, “and should be changed.”

One possibility for avoiding the issues associated with rebuilding after a natural disaster is to increase the resilience of the community before a disaster even occurs by investing in disaster mitigation. These types of investments are much more effective as they reduce the immediate effect of a natural disaster (as well as its long term impact) and allow for a quicker recovery phase. In a report published by the World Economic Forum, one of the key points stated that a “lack of... investment in physical resilience measures, with too much focus on post-disaster response, leads to increased loss of life, suffering and damage.” (World Economic Forum, 2010) However, as long as there are natural disasters, there will still be a need to respond to these disasters in a quick, efficient, and culturally appropriate way and this issue will always be relevant.

The solution to post-disaster rehabilitation is one that will require a massive amount of collaboration of people from the local affected communities and humanitarians around the world. Experts from many different professions need to communicate the problems and observations to each other. Right now, the architectural community seems to be behind in this discussion. In the On Site Review Report by Sultan Barakat, which highlights some of the features of Shigeru Ban’s post-tsunami housing in Kirinda, the point is made that “post-tsunami recovery is viewed as an ordinary community development challenge rather than as an architectural issue.” (Barakat, 2013) Architects should be more involved in the issue of disaster recovery in developing countries. The ignorance of the architectural community as a whole, if not addressed, will lead to repeats of the problems with post-tsunami housing in Sri Lanka. With the growth of the International Development and Aid Industry, reports on the benefits and issues of specific disaster recovery projects are becoming more readily available and more legible to those not directly involved in humanitarian work. Architects should take advantage of these new resources to learn from the mistakes and lessons already learned by those working in this field (such as Martijn Schildkamp and Shigeru Ban). Hopefully, a more enlightened community of designers can begin to make thoughtful interventions in disaster stricken communities

without overstepping their bounds and instead empower the communities which they aim to serve. In this way, there can be a new and more effective approach to rebuilding after a natural disaster which uses the resources and technical knowledge of donors and the innate cultural understanding of the recipient in a collaborative partnership.

## NOTES

<sup>1</sup>The cost of the reconstruction in Sri Lanka was much higher than the predicted costs. High levels of reconstruction activity associated with disaster rehabilitation will produce a type of “Dutch Disease” where construction cost increases will escalate rapidly with the increase in demand. In Sri Lanka, the cost in this sector had risen by 30-50 percent in August 2005 and by September of 2006 had risen by 60-80 percent. The GoSL has limited options to address the subsequent funding gap and such an increase in cost was not anticipated (though as this is a common phenomenon in disaster reconstruction, it could—and arguably *should*—have been accounted for in initial cost estimates). Those who started construction early (mostly driven individuals in the Owner-Built Program) were much more successful in completing their homes than those who waited until the inflation had set in.

<sup>2</sup>Sri Lanka’s ethnic composition before the tsunami was 74 percent Sinhalese (mostly Buddhist), 18 percent Tamil (mostly Hindu), and 7 percent Muslim. The Sinhalese, which primarily live in the Southern and Western Provinces, have dominated Sri Lanka’s political and economic systems since the country gained independence from the British in 1948. The Tamil population on the other hand has faced extreme discrimination due to their isolation in the Northern and Eastern Provinces and subjugation to policies which promote the Sinhalese way of life. Understandable feelings of frustration by the Tamil, eventually manifested into a desire to found a separate state for this minority. The LTTE, established in the mid-1970s, ultimately became the leader of this movement and thus began the civil war that would last a quarter of a century. This conflict clearly interfered in the equal rehabilitation of Sri Lanka following the 2004 Indian Ocean Tsunami.

<sup>3</sup>The hope was that P-TOMS would enable tsunami funds to be channeled directly to tsunami victims in the Northern and Eastern Provinces. The negotiations, however, postponed its implementation to the point that it was unnecessary by the time it was eventually signed. Donors, not wanting to wait to begin projects, had already allocated funds through other channels. In addition, this agreement had been under great opposition by the Sinhalese nationalist, as well as the Muslim minority who were suffering heavy discrimination in the LTTE territories. The Muslims were left out of the negotiations between the GoSL and the LTTE, and they feared that any peace formed between the two would come at the cost of Muslim rights and political power. The Sinhalese nationalist saw P-TOMS as a stepping stone to the formation of a separate Tamil state and were therefore aggressively against the agreement. In fact, in July of 2005, only a month after it was signed, this group challenged P-TOMS in the Supreme Court, claiming it was unconstitutional. This resulted in certain elements of the agreement being put on hold until their legitimacy could be verified. With the election of Mahinda Rajapaksa (a leader of the Sinhalese nationalists) in November 2005, the failure of P-TOMS became irreversible and the hope for a peaceful resolution to the conflict between the GoSL and LTTE was all but abandoned.

<sup>4</sup>One of the most recognizable tsunami housing projects in Sri Lanka, are the dome-shaped houses in Pottuvil. To an untrained eye, it might seem that the construction was attempting to honor or was inspired the history of dome-shaped architecture in Sri Lanka. These houses, despite their simple building process and promised resiliency, were ultimately rejected by the members of the local community. The design was considered odd and alien and the seriousness of this issue became apparent when a father expressed his concern at being able to marry off his daughters. In many communities in Eastern Sri Lanka, the house of the daughter is given as a dowry for the marriage. The father in this case was concerned that he would never find a husband for his daughter because no one would want to inherit such a house. This housing solution, while giving considerable thought to ease of construction and lasting structural strength, failed to provide an appropriate design aesthetic that the recipients would be comfortable inhabiting. Anthropologist Dennis McGilvray condemns these proposals that are “methodologically creative but ethnographically clueless...” and could “hinder the social resilience of local communities in ethnically distinct regions of the island in the long run.” (McGilvray, 2006)

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