ABSTRACT: After the 2004 Indian Ocean Tsunami, major housing reconstruction programmes were implemented in the affected countries. Five years after, the houses that were built offer post-occupancy lessons. This paper is based on Sri Lanka, one of the countries most severely impacted by the tsunami. The experience of these large reconstruction programmes prompts a fundamental question: what design and planning features should be encouraged, and what should be avoided, in post-disaster housing reconstruction programmes? Based on primary information from interviews of community members and representatives of agencies involved in planning and implementing the programmes, three main aspects are discussed – design, construction and post-occupancy issues. From the micro-scale of design of spaces within the house to the urban scale of settlement layout, the achievements made in the context of a highly constrained post-disaster situation as well as issues that required more careful attention are discussed here. The paper underscores the importance of resilience and capacity for adaptation of the communities in these settlements, and highlights the necessity of involving local communities in all stages of housing reconstruction.

Keywords: Tsunami, Housing reconstruction, Sri Lanka, Adaptation

BACKGROUND

In the severity of devastation wrought by the 2004 Indian Ocean Tsunami, among the most destructive global disasters of recent times, Sri Lanka was second only to Indonesia, with the loss of 36,000 lives, displacement of 800,000 people and destruction of 120,000 houses (Asian Development Bank 2005). A 1,000 kilometre stretch of coastline was affected, from Jaffna in the north to Colombo in the southwest (see Fig. 1). The worst destruction occurred in the east, while in the south the damage was generally more moderate. There were, however, pockets of acute damage along the southern coastline, such as in Seenigama and Hambantota, two of the case study locations of this paper. For example, parts of Hambantota town were engulfed by a 6.5 meter wave that levelled much of the town centre and densely populated residential areas. The death toll exceeded 1,400, with an estimated mortality rate of over 40 per cent in the worst affected areas. Over 600 houses were destroyed and 2,121 people were rendered homeless (Department of Census and Statistics 2005). Extensive reconstruction programmes were mounted in the aftermath by a plethora of international humanitarian agencies. Because of the government’s policy of resettling affected communities away from the coast, resettlement schemes were established on new land, representing new urban development, and the cases studies discussed here are drawn from such schemes. All the housing in these schemes represents new houses built in new locations, not in-situ rebuilding of destroyed or damaged houses.

Figure 1: Map of Sri Lanka showing the tsunami-affected areas
1. CASE STUDIES

All the cases studies are donor-driven contractor-built housing. In Hambantota investigations were undertaken in New Town - the site for a major new residential development of 2,330 houses, the largest post-tsunami resettlement project in Sri Lanka. Implementing agencies included prominent international NGOs, local NGOs, religious organisations and schemes supported by local politicians and business enterprises. A rather different programme supported by an international NGO comprised of 4-storey apartment blocks in a central location in Hambantota town was also studied to obtain insights on a very different housing pattern compared to the predominant bungalow types in New Town. In Seenigama, two programmes funded by different donors but implemented by the same agency were studied. Unlike the Hambantota cases, which were donor-driven schemes on public land, in Seenigama the programmes were implemented on private land by a local NGO with funding from international donors. Interviews of beneficiary households and representatives of implementing agencies, supplemented by on-site observations, served as the primary basis for this paper. The names of agencies have been kept anonymous to protect their identity. Basic information of the case studies is shown in Table 1.

Table 1: Basic information on the case studies

<table>
<thead>
<tr>
<th>Programme Locations</th>
<th>Total beneficiary households</th>
<th>No. of households interviewed</th>
<th>Basic features of the programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Town, Hambantota (various schemes)</td>
<td>2330</td>
<td>25</td>
<td>Mostly single storey dwellings on 506m² lots built by various agencies on new resettlement site</td>
</tr>
<tr>
<td>Hambantota town</td>
<td>40</td>
<td>4</td>
<td>Three 4-storey blocks, two with 16 apartments each and one with 8 apartments within a walled compound in central location</td>
</tr>
<tr>
<td>Victoria Gardens, Seenigama</td>
<td>84</td>
<td>7</td>
<td>21 2-storey townhouses each with 2 units around a central open space with community facilities within a walled compound</td>
</tr>
<tr>
<td>KPMG-LOLC settlement, Seenigama</td>
<td>50</td>
<td>6</td>
<td>Implemented by same agency, two donors each funded 25 single storey houses on 151.8 m² lots within a walled compound</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2374</strong></td>
<td><strong>42</strong></td>
<td></td>
</tr>
</tbody>
</table>

2. PROGRAMME PLANNING

The national Urban Development Authority (UDA) had a fairly comprehensive set of generic guidelines for house construction, but in the flurry to reconstruct quickly most agencies did not appear to have followed them and UDA neither enforced them very stringently. Two main guidelines seemed to have been followed – minimum plot size (152 – 506 square metres) and minimum house size (46.5 square metres). Some agencies followed the guidelines for minimum bedroom size (8 square metres). Houses were required to have an internal kitchen and lavatory, and although this was followed, recommended sizes for these spaces did not seem to have been followed in all cases.

In New Town, public woodlands was cleared, opening up unserviced land for the resettlement programme; as per UDA guidelines, because of the initial lack of piped water supply and sewage disposal large plots of 506 square metres were allocated. It seems to have been overlooked that New Town was part of an ongoing, albeit slow, larger urban development plan and the area would soon be included within the urban boundary, necessitating the extension of piped water supply, already in place, and sewerage. In that regard, the inhabitants of New Town seem to have gained an inadvertent benefit. In comparison, in the Seenigama schemes, plot sizes were of a much smaller size of 152 square meters – following UDA’s guideline for plot size in areas with piped water supply and sewerage.

3. DESIGN ASPECTS

3.1. Preference for housing typology

Apartment-dweller beneficiaries of the Hambantota town scheme (see Fig. 1) greatly envy the residents of New Town as they live on the ground level and have large plots such that they are able to cultivate gardens and trees, and enjoy the benefits of open space around the house. Corner apartments are preferred more because of the adjacent openness, while nobody wanted the central apartments because they were hemmed in from two sides. This scheme was originally planned for 432 apartments, but was eventually reduced to 40 as the number of interested beneficiaries was very scanty, despite the benefits of living in a central urban location. It was reported that 90 percent of the beneficiaries of the urban scheme would have preferred to live in New Town if they had that option; preference for the single-storey bungalow typology was much more widespread and common than for multi-floor apartments. Moreover living in apartments necessitated cooking with gas fuel as there was no provision for cooking with cheaper biomass fuel, an additional expense most households were unwilling to accept. Most beneficiaries of apartment housing not being successful in being selected for other schemes decided to accept the apartments. Hence, not surprisingly, many have rented out or sold their apartments and sought accommodation more to their liking.
3.2. Site Planning

There were no guidelines for communal areas such as playgrounds, parks and meeting centres. It was up to individual implementing agencies to incorporate these into their schemes, resulting in varying quality of such spaces. Some schemes barely had any communal spaces; others that did were not functional, while a few had invested significant care in developing such spaces. It appears that the bulk of the effort had been invested mainly in building houses; the linkage of the private domain of the house to the semi-private space around the house, and in turn to the public domain of communal spaces, that is, a sequential hierarchy of spaces as an essential aspect of site planning does not seem to have been understood. Instead of establishing and linking a variety of communal spaces of different scales to create a vibrant outdoor living environment, unimaginative and regimental grid-iron or barrack-type layouts have been implemented in most of the schemes (see Fig. 2).

![Figure 2: Barrack-type layout of bungalow style housing in New Town, Hambantota (left) and apartment blocks in central location in Hambantota town (right).](image)

In New Town, only one scheme was found where care was taken to align houses and roads along existing contours of the site and variety in layout and design of houses, communal areas and open spaces was attempted. Instead of the typical one-size-fits-all approach, a number of house designs including shop houses were produced and beneficiaries were given the opportunity to choose, resulting in a degree of satisfaction with the quality of open and communal spaces, and the variety of the built environment. However in other schemes even where parks, playgrounds or other community facilities were provided, they tended to be neglected, perhaps because of the unimaginative way they had been designed. Not comprehending that the problem was with the design, an annoyed agency staff member blamed beneficiaries, “They are bumpkins and don’t know how to use such facilities!”

In a scheme in Seenigama, while the site plan included a central rectangular communal area (see Fig. 3), 152 square metre plot sizes were too small to have much open spaces around the houses. It is common practice to plant trees and grow vegetables around the house and in the warm climate to serve as outdoor extensions of the house, but scope for this was very limited, resulting in widespread complaints by beneficiaries. Although children did play in the central open area, most adults tended to ignore it and instead tried their best to utilise the small space around their houses for socialising and relaxing.

![Figure 3: Scheme in Seenigama where houses of the same design had been orientated in different directions around a central open area](image)

In the apartment compound in Hambantota town, there was a communal park/playground area, which was initially ignored and became overgrown. Subsequently the support of community development agencies led to voluntary initiatives by beneficiaries to improve the area. Residents began viewing it as their responsibility, children started using the playground and a sense of community ownership was gradually established. This indicates that such schemes, essentially a “community of strangers” as one resident described, comprised of beneficiaries that do not have a background of apartment living, require support and organising by agencies, often over a long term, to function as a cohesive community. Such a strategy should be included at the outset of programme design, otherwise well-intentioned communal areas are likely to fail and become negative spaces.
3.3. Environmental and climatic responsiveness

3.3.1. Heat
In the hot-humid climate, natural ventilation is necessary for thermal comfort. Ceiling and stand fans are used, but air-conditioning is generally unaffordable. Thus house orientation is important: it should face the southerly wind direction so that the main living spaces are ventilated and have minimal exposure to the west to avoid afternoon heat. If the site configuration constrains ideal orientation, specific passive cooling devices such as cavity walls, extended eaves and design of openings to maximise wind flow and block solar heat can be incorporated into the design; there are many longstanding guidelines for designing buildings in tropical climates (for example, Givoni 1976; Koenigsberger et al 1973; Olgay and Olgay 1963). These basic concepts have not been used in most cases. The same layout with similar openings was found facing different directions; those living in houses facing south were fortunate, while others, particularly in houses facing west had to experience severe discomfort (see Fig. 3).

Appropriate landscaping can also contribute to heat protection. In New Town, the original woodlands were cleared to make way for the resettlement programmes, consequently resulting in barrenness and exposure to the sun. Only one scheme was found where there was minimal felling of trees, resulting in a shaded area with comfortable micro-climatic conditions. Many residents praised this comfortable environment and mentioned their satisfaction. However, sometimes branches used to be cut by residents for household fuel – a source of conflict between the community and implementing agency that wanted to preserve trees.

3.3.2. Dust
Adding to the heat problem in denuded New Town there was the problem of dust from unpaved walkways, as well as insects and vermin from the nearby woods, which compelled households to keep windows closed, creating a furnace-like indoor condition. Contextually inappropriate elements such as concrete grills and fanlights added to the problem: for privacy and safety, and to prevent entry of wind-blown dust and rain, such elements were blocked or boarded up by residents. Fortunately because of large plot sizes of more than 500 square metres, households were able to utilise outdoor spaces as a reprieve. Some of them had planted trees around the house and benefitted from the shade. Also because of the openness of the area, not being in a densely built up urban area, there was always a flowing breeze, and after a rainy spell when not carrying too much dust, provided a degree of comfort, especially if one was lucky to own a house with a south or east facing veranda.

3.3.3. Rain
Houses in all the schemes studied (except one) in New Town and in one of the schemes in Seenigama did not have inside ceilings; compounded by poor workmanship in laying roof tiles, water leaked into houses during rain. In the Hambantota apartment scheme, openings in the stairwell wall without glazing or rain-protection devices allowed rain penetration, making the stairwell wet and inconvenient for movement and liable to accidents, as well as affecting the structure and finish, and contributing to deterioration. Small thresholds had been built at some apartment entry doorways, preventing water from flowing inside unless it rained heavily. The problem of rain splashing on houses and entering through the gable ends, open fanlights, flooding verandas, and in the urban apartments entering through the open stairwells, resulting in flaking of plaster, staining and weakening the structure should have been anticipated as the strong monsoonal rains is a salient feature of Sri Lanka, and design measures should have been taken that are used widely in such tropical climates.

3.3.4. Hazards
In the Hambantota urban apartments earthquake-resistant features had not been considered, though the area is seismically active. Multi-storey apartment dwellers are much more at risk from seismic hazard than in single-storey houses with a lightweight roof such as in New Town. Apartment residents were aware of this hazard and after a tremor in April 2009 there was widespread panic and many residents ran out of the buildings in fear. In addition, work in the nearby under-construction port resulted in frequent vibrations, affecting the structure and creating cracks in walls as several residents pointed out, thus making the structure more vulnerable to seismic risk. Nonetheless some credit should be given to the implementing agency of this scheme. Fire extinguishers had been placed in the stairwells with a system of annual checking and refilling; double lights have been provided in the stairwell, so that if one light stops working there would still be light from the other one to prevent accidents. So some degree of risk reduction and accident prevention has been considered.

In New Town, one of the agencies had followed wind-resistant roof design guidelines, but no other hazard seems to have been considered in the house design. Here, though the houses are less substantial than the apartment buildings, turbulent water flowed through the area during the rainy season and removed soil below and around foundations, especially because in most cases the typically loose sandy soil had not been compacted before constructing on it, greatly weakening the houses and making them vulnerable to impact of various hazards. When asked about potential hazard impact on the house, one beneficiary commented worriedly:

This was a very faulty job; it’s [the house walls and floor] cracking again and again. It’s already half gone, can’t expect anything to remain if there is a big storm or earthquake!

It has to be acknowledged though that the houses are often significantly better than previous houses of many of the beneficiaries who formerly lived in thatched huts along the coast, which were frequently damaged by fire and floods. Several interview respondents mentioned how grateful they were to receive a permanent house, even though it was so small and cracking in many places. However this should not serve as an excuse for the implementing agencies. Even though circumstances were trying after such a major disaster, abundant funds were available, but this opportunity was not used effectively to construct much better housing.

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3.4. Cultural fit

The UDA guidelines stipulated that the kitchen should be within the house, followed in the reconstruction projects. However this required cooking with gas or kerosene, which was often unaffordable, or in the case where a chimney had been included above the kitchen for cooking with bio-mass fuel, smoke and odours from the kitchen wafted into the house and created an unpleasant indoor environment. Because most of the houses had not been fitted with interior ceilings, walls did not go all the way to the top and therefore smoke from the kitchen could flow easily to the other rooms. In this situation, most beneficiary households had built an external kitchen to cook with bio-mass fuel on earthen stoves, often in a lean-to structure against the back wall (see Fig. 4). Those able to afford it built large external kitchens, but poorer households built makeshift external kitchens that suffered the vagaries of climate. The original kitchen was used mostly as a storeroom, pantry or converted for other functions such as children’s study or a small bedroom in the case of a large family. Indeed, the fact that the room was originally intended for a kitchen was widely not recognised; when asked why they built an extra kitchen, many households replied, “There was no kitchen in the house.” This is an example of culturally inappropriate design.

![Figure 4: Extensions for kitchens for cooking with bio-mass fuel were built widely at the back of houses](image)

When a government official was asked why such kitchens were provided, and why such guidelines had been formulated by Sri Lankan authorities such as UDA, where staff were familiar with such socio-cultural patterns, the answer was, “They [the beneficiaries] cannot forever remain like that; they have to improve themselves and learn to use a modern kitchen.” Or as an agency staff member in Seenigama said, “We wanted to elevate their living standard.” This example highlights the mismatch between agency perceptions and beneficiary needs resulting in culturally inappropriate design – a consequence of the lack of consultation in the housing design and implementation process and also differences in lifestyles, standards and viewpoints of urban-based relatively affluent professionals and the largely poorer rural or provincial beneficiaries of reconstruction programmes.

One scheme in New Town should be acknowledged for its better understanding of the kitchen issue. While fulfilling UDA’s requirement, it was understood that beneficiary households would in time build an external kitchen; therefore when houses were built, a steel and wire mesh structure was attached at the rear so that households would be able to utilise it for building a kitchen, thus making the process easier. Such an approach is culturally appropriate, while at the same time conforming to regulations, failing which would create conflict with local authorities.

4. CONSTRUCTION

4.1. Typical construction and building materials

Predominantly brick, or to a limited extent concrete block, infill masonry and reinforced concrete (RC) frame was used. Rubble or RC foundations typically supported an RC floor, usually with a cement concrete (CC) finish. Roofing was typically of clay tiles on timber framing, though there were a few variations, such as asbestos roofing sheets, and the use of concrete rafters to conserve timber supplies. In multi-storey housing RC intermediate floors were constructed with CC finish and the top roof was built of clay tiles on timber framing. Timber was widely used for door panels and door and window frames, but there were some exceptions where aluminium frames were used. Glass sheets inset in timber shutters or framing was widely employed for window panels.

4.2. Widespread construction defects

Poor quality construction was evident in all the schemes to varying degrees. Particularly concrete work – CC or RC in floor and roof slabs, stairs, mortar, plastering, built-in shelves, mouldings, etc – was found to be of low quality for a number of reasons: low cement content in the concrete mix or insufficient steel reinforcing to increase profit margins of contractors, as cement and steel are expensive and often imported commodities; insufficient or no curing of concrete; deficient manual mixing and casting; poor shuttering and formwork allowing moisture to escape resulting in rapid drying and shrinkage; lack of supervision. Such problems are common in most developing countries of South Asia and construction with concrete requires competent supervision.

4.3. Cracking concrete floor slabs

To analyse one of the problems most widely noted, cracking of concrete floor slabs (see Fig. 5): The soil in the semi-arid region of Hambantota and also the coastal area of Seenigama is generally loose and sandy, composed of large grains. In order to build upon it, it has to be compacted thoroughly to prevent subsequent settlement. Often for very loose, non-cohesive sandy soils, an extra measure of stabilising with lime or cement might be necessary.

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Additionally, a grade beam should be used to prevent spread of the foundation footings. As with all concrete products in a tropical context, the floor slab needs to be cured by keeping moist for up to 3-4 weeks to prevent shrinkage cracks due to heat.

These measures do not seem to have been followed, perhaps in the rush to build houses quickly after the tsunami, resulting in extensive cracking of floor slabs. Because in most cases there was no finish on top, such as floor tiles or carpets, the cracks were all too visible. The UDA guidelines do suggest including a grade beam, and it is reported that officials insisted on incorporating it during site visits. It is not certain how many agencies actually paid heed. It appears that there is an overall lack of awareness of good construction practice. Even a government officer involved in the reconstruction programmes was found to comment, “The soil here in Hambantota is too loose, so floor slabs are bound to crack. There is nothing you can do about it.”

Figure 5: Structural cracking of concrete floor slab

4.4. Extensive poor construction
Evidence of various types of poor building materials and construction was evident – low quality bricks, timber, door and window hinges and locks, plumbing fixtures, etc. Poor workmanship, for example in laying roof tiles, was widespread. Many tiled roofs leaked and residents complained of a “drizzle” inside the house during rain. Laying clay tiles is a skillful and laborious process, which may have been neglected during the post-tsunami housing reconstruction rush. After laying tiles, identified gaps need to be closed, but there was hardly any evidence of that being done. Additionally, clay tiles should be tied to the frame to prevent dislocation in strong wind in such a coastal location, but as that had not been done, the tiles may have shifted in position over the seasons, creating gaps and allowing water penetration.

5. POST-OCCUPANCY ASPECTS

5.1. Transfer of ownership or residence
Perhaps the most unanticipated aspect not accounted for in project planning is that a significant proportion of beneficiaries in all the case study programmes had sold or rented their houses. The fundamental cause of providing houses to those rendered homeless by the tsunami seemed to have been lost in this process. For many beneficiaries, ownership of a house on a large plot allowed entry into a market to which they had no access in the past. One gets the impression of active market dynamics within many of the schemes – some people were buying several houses, others selling, some renting and subletting - not only as homes, but also for shops and enterprises. Many others retained ownership, but did not live in the house, only visited from time to time to ensure continuity of ownership. At the same time, other groups were being settled into the schemes, particularly in New Town, because a surplus of housing had been built partly because of the abundance of funding that had flowed in after the tsunami and also because the funding was channelled away from the conflict-ridden, though more affected, eastern areas.

A key aspect not taken into account was the traditional family structure, a reason for the widespread transfer of residence and ownership. Joint or extended families are common in such communities and nuclear families was generally uncommon except among higher income urbanites. Even if extended families did not live under the same roof, they preferred to live nearby and it was common in rural or informal urban settlements that neighbours are often relatives. The government’s policy was to allocate one house to each tsunami-affected family even if the families were previously living under the same roof. When post-tsunami housing was allocated, the typical family-based settlement pattern was ignored. Different members of an extended family were provided houses by different donors, not necessarily nearby or in the same location. Thus after receiving houses, they transferred them and moved closer to relatives living elsewhere who had received houses from a different programme.

5.2. Repair and maintenance
Implementing agencies mostly provided a one-year warranty on the houses and during this period made repairs and rectified faulty construction if complaints were made. However, about two to three years after completion, major problems of poor construction were evident in most cases, as discussed above in section 4. It is unacceptable that such problems emerged within such a short time. Many of the beneficiary households did not have funds for repair and continued to live in faulty houses. Cracks became easily infested by insects and plants and roots grew, expanding them. Despite so much evidence of poor construction, agencies were usually reluctant to show accountability and tended to blame the contractor, or even beneficiaries, as one agency staff commented:
They [beneficiaries] are responsible for the cracks. They keep making extensions to the house and in the process weaken the structure and then cracks develop.

Most of the houses required significant repairing, some of which could be done locally; but in many cases the faults were structural and irremediable, such as cracking and settlement of floor slabs and large chipped areas of concrete components. Understanding this, a beneficiary in New Town commented:

I know this house needs repair, but it has already become too weak and I am fearful that it may collapse if I try to make repairs. We will need to demolish this house and build a new one.

Donors expected beneficiaries to repair the houses after given ownership, but they overlooked the resource constraints, both technical and financial, of communities that had been severely impacted by such a massive disaster. Thus the long-term performance and liveability of these houses was uncertain, with the burden of coping resting on the beneficiaries' shoulders.

5.3. Extensions and alterations to houses
Although there were stipulations against altering the houses, these were rarely enforced. Indeed in New Town, most donors no longer had a presence in the locality or even in the district. Because of large plots sizes of more than 500 square metres, many households had been able to convert part of the house into a shop or small scale workshop, or to add an extension for that purpose. For example, one household was found to be producing concrete blocks in the front yard and selling it from a small shop built along the plot boundary. An area adjacent to New Town had been set aside for retail development, but construction had not yet commenced and due to the lack of nearby markets or shopping facilities, local shop-houses provide groceries, snacks, video rentals and telecommunications services, and other such commodities. In Seenigama, because the plot sizes are much smaller (152 square metres), not much open space remains after placing a 50 square metre house on it. Many beneficiaries had planted fruit trees and cultivated small vegetable gardens in the narrow strip of land around the house, allowing some income, but there was very little space for building extensions for shops. Some small households have converted the living/family room to run a small shop, but these were few. Many of the households complained about the lack of space for outdoor activities and building extensions, and particularly to run a small income-generating business, common in such communities. Most beneficiaries were critical of the one-size-fits-all approach where no consideration was given to household size, age, disability or other such factors in the design and allocation of the houses, necessitating owner-built modifications and extensions.

CONCLUSION
Agencies implementing post-tsunami housing reconstruction programmes operated under trying circumstances and the challenges in such a context were many. There are some success stories, such as the scheme with environment-sensitive site planning in New Town, but these are isolated examples and their impact is limited. Particularly in house construction, the key ingredient in the programmes, the performance has been less than satisfactory. From the accounts above, it is clear that agencies implementing post-tsunami reconstruction programmes in Sri Lanka largely missed their mark. Despite an abundance of funds available, for a variety of reasons agencies by and large have not been able to set an example of sustainable, community-responsive housing reconstruction. There was potential to utilise the abundant funds effectively and the opportunity to develop a model process offering lessons beyond the Sri Lankan borders. Donors alone cannot be blamed; the government also exerted pressure to build houses quickly (Caritas 2007) and donors engaged in a sort of competition on who could build most in least time (Greenblott 2007), in the process quantity compromising quality. In this ‘race’, beneficiary consultation was viewed as time-consuming and the government imposed its selection and allocation process on the donors, which in most cases complied in order to be allowed to implement their projects. The adage “haste makes waste” is apt in this context.

Figure 6: Ground floor of a house in Seenigama converted into a shop (left) and an improved house with banana plantation in Hambantota New Town (right)

Now that most donors have withdrawn and the memory of the tsunami has faded in the face of other current issues, beneficiaries of the reconstruction housing have become isolated and begun to address their problems by themselves. Most of them have proven themselves to be resilient, adaptive and resourceful, and to seek ways of improving their living conditions and livelihoods, indicated for instance by the informal shops (see Fig. 6) and workshops mentioned above. Where space was available many have carefully nurtured home gardens, growing food.
as well as attempting to overcome the barrenness of some of the areas. In the absence of an adequate waste collection system, many households manage their own solid waste by separating organic waste for garden compost and burning and burying non-biodegradable waste. Home-made raffles and scarecrows are placed on fences to scare wild elephants in New Town. One household was found to have dug out its malfunctioning septic tank and built a larger and better one. Another household, allocated an abandoned incomplete house from the first lot of initial poor quality housing in New Town, spent more than SL Rs 400,000 (about US$4,000) from personal savings and loans to repair and complete the house - much better quality than many houses built by donors. The front yard of this house had been converted into a small banana plantation, bringing income (see Fig. 6). An elderly woman in one of the Seenigama schemes was found to have built an attractive fishpond in the small front yard to bring some beauty to this monotonous scheme.

These examples indicate that such communities have inherent skills and are able to maximise them with some support, in contrast to top-down heavy-handed processes that undermine such skills. Consultation and participation of communities at all stages of decision-making, design and implementation coupled with adequate technical and managerial support can enhance the quality of the programmes; this was largely not recognised. In most cases, there was hardly any consultation with beneficiaries; most were simply allocated a house for moving into. There were some exceptions, albeit in a very limited sense: in a few cases, beneficiaries were given a choice of schemes and sometimes houses were allocated by public lottery within a particular scheme. Although in some cases, beneficiaries were shown house designs and even allowed to oversee the construction, in most cases they had no involvement in developing or influencing the house design.

A different approach, owner-driven housing, instead of the donor-driven contractor-built housing of the case studies offers many advantages. It is beyond the scope of this paper to discuss this in detail; only to mention that agencies that adopted this mode, such as UN-Habitat, reportedly had better results. For example, adjacent to one of the schemes in New Town, households had been given money and new land as compensation for their former land acquired for port development. Here houses were being built by the households themselves, and although not technically and design-wise perfect, they appeared to be better that those across the road built by donors. Several beneficiaries in the case study schemes, themselves having construction skills or links to local construction workers, repeatedly mentioned, "If they gave us the money, we could have done a better job." Recent major disasters, such as the 2004 tsunami, and extensive housing reconstruction programmes have paved the path for productively assessing achievements and shortcomings. It is now an opportune moment to use the lessons gained to move forward towards future production of housing after disasters that is culturally appropriate, contextually responsive and sustainable.

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