

# PCR TOOL 8

## Participatory Design

### Introduction

**PCR Tool 5: Learning from the Housing Sector**, describes how housing is produced in varying contexts. The use of a professional architect to design a house to a client's individual specifications is predominantly reserved for the rich. Most who purchase housing in the formal sector have their houses designed by a developer and built by a contractor, with limited opportunity to influence the process. These two cases refer to formal urban housing. With informal housing, both urban and rural, residents may engage local builders who use traditional designs. One example of this is in East Africa, with the "Swahili House". This generally contains a central corridor, with rooms on each side and a veranda to the front. Where housing is built by residents themselves, or built incrementally, there may be less thought about the design. Therefore, when a disaster strikes, it is usually the low-income, informal housing that suffers the greatest damage. This is mostly attributed to poor location, poor construction and maintenance, and low-quality materials. However, the design may also be to blame. For a building to be disaster resistant it must comply with certain rules related to the location of buildings, their shape, the position of openings, and their structure. Many architects and engineers know these rules, but residents and informal builders frequently do not. Hence the involvement of architects and engineers in reconstruction is important. This is no reason to advocate a top-down reconstruction process, however. Participatory design brings together residents and professionals, to ensure that both have a say in how houses are rebuilt. This not only creates safer housing, but also ensures that the people's own resources are mobilised and contribute effectively. Participatory design enables residents to stamp their own identity on their living environment, generating greater satisfaction and ownership.

### Why is design important for building back better?

A good design can dramatically change the resilience of a building to disasters. This is evident in studies of the design and production of housing in a given location, and disaster-damage assessments.

In **PCR Tool 5: Learning from the housing sector**, we described three predominant housing production processes and how these influence disaster performance. Informal housing was shown to perform worst as a result of underlying factors, such as poverty and vulnerability, forcing people to build on risky sites with poor materials and designs. Some of these factors may change following a disaster, for example, there may be temporarily more resources available for housing, but many factors will remain unchanged and need to be considered when designing for disaster-resistance. Fortunately, informal housing does not always perform badly. Some is designed following informal traditional rules based on previous disaster experience; architects or engineers may be able to identify these features and incorporate them in reconstruction. For example, following the 2005 earthquake in Pakistan, traditional timber frames, *dhajji dewari*, were used based on experience of their resilience.

In **PCR Tool 3: Learning from Disasters**, we explained how damage assessments of housing following a disaster can help define which designs and technologies are most disaster resistant. Studies of the damage caused by earthquakes have highlighted the most common design weaknesses: poor site selection, (on slopes prone to landslides or in plains that suffer from liquefaction); irregular building shapes; openings too close to corners or intersections or irregularly distributed; heavy roofs; absence of horizontal reinforcement and lintels over openings that do not protrude sideways sufficiently; poor or absent foundations; weak bonding, particularly at corners; poor structural connections; alterations to buildings; and weak first floors, very open in plan and with overhanging higher floors. Similar studies after storms point at the following common design problems: selection of exposed sites; poor foundations not anchored strongly to the ground or well connected to the walls; open verandas or large eaves the wind can get under to lift the roof; buildings partly on stilts that can be lifted; poor structural connections and lack of bracing; low roof pitches that cause the roof to be sucked off; poor fixing of roof sheets that can send them flying; openings too near to corners; openings only on the wind side, with no outlet on the opposite site; and louvred windows.

Whilst Tool 5 helps explain why and how people design houses the way they do, Tool 3 has highlighted the strengths and weaknesses of those designs. We need to take into account both of these factors in reconstruction. The simplistic approach of providing cash grants is insufficient to ensure effective reconstruction. Used alone it will frequently result in poorly resistant housing, because people:

- may not understand how and why certain house-types are more resistant to disasters than others;
- are unlikely to use a knowledgeable designer;
- may copy what others are doing, without being able to verify whether that is good or bad;
- may build hybrid houses, a mixture of modern and traditional shapes and materials, which tend to be less resistant;
- may try to build on top of partially destroyed houses, perpetuating the risks.
- can be over-ambitious, starting to build a house that is too big for their budget, then leave it unfinished or finish it poorly, increasing their vulnerability.

These problems can be avoided through involving of architects and experienced professionals in the planning and reconstruction process. However, architects must understand local building techniques and preferences. A study of the housing sector can help them to do so. They also need to know existing local approaches to withstanding disasters which can be understood through conducting damage assessments, observations, published documents and talks with key informants.

## Disaster-resistant design principles

From decades of disaster damage observations and experience designing reconstruction projects and programmes, we now have a good knowledge of disaster-resistant design principles. Those applicable to small buildings such as houses are listed in the table on the opposite page for the most common disasters: storms; earthquakes; floods and landslides. A lot more detail can be found in the literature; see, e.g. Coburn et al. (1995) in the Resources section.

## The importance of participation

It was recognised as early as the 1970s by authors such as John Turner (1976). that residents make most of the decisions in low-income housing. He argued that the process of producing housing is more important than the actual end product, since it builds people's capacities and empowers them. In 1976, the first Habitat Conference in Vancouver made people's participation a central element of

future housing policies and strategies. But housing agencies struggled to implement it, facing the dilemma of determining : *'whose participation in whose decisions and whose actions'*? (Turner 1976) In today's terminology, we would probably call this the dilemma of good governance. There is ample evidence now that participation and the establishment of partnerships between various stakeholders can be effective in solving deficiencies in housing and related services, whilst at the same time building the social and human assets of those involved (see e.g. Hamdi, 1995). Yet, many humanitarian agencies involved in reconstruction are still struggling with this dilemma. They tend to work in a 'supply mode' when providing relief, which makes it hard to shift to a 'support mode', when they get to reconstruction. As a result, participation is practised in current reconstruction projects and programmes, but not in the design stage. If people are to be less vulnerable to disasters in the future, they not only need more resilient houses, but also to become more resilient themselves. The process of participation helps to empower them, to build their capabilities and social networks, and to consider livelihoods issues in reconstruction, all of which are key components of vulnerability reduction. Thus, participation needs to be ensured from an early stage in the entire reconstruction process, including the design stage.

## A changing role for architects

In some countries, the traditionally elitist role of the architect who mainly works for wealthy clients, is changing. The Dutch architect Johan van Lengen, working with the people of Mexico and later Brasil, described these reoriented professionals as **'barefoot architects'** (1982); others, like Rod Hackney in the UK (1988) call them **'community architects'**. Pioneers in the USA include Michael Pyatok and Hanno Webber. In North America and Europe, community architects are assisting low-income families and homeless people to renovate derelict inner city buildings into living spaces; others work with the inhabitants of old and poor quality neighbourhoods to upgrade or renovate housing. Also in North America and in Japan, a network of community design centres has been set up, generally in lower-income urban areas, where local residents can obtain advice and information, get drawings prepared for buildings or renovations and get in touch with builders who have been vetted on the quality of their work. Rodolfo Livingston is well-known for his work in Argentina and Cuba. In the latter country, the Programme of the Architect of the Community is now well established, in which architects work with communities to develop housing designs that they or organised building brigades can use for construction. It is from such pioneer architects,

## Some principles of designing for safety

Designing for wind resistance	Designing for earthquake resistance
<ul style="list-style-type: none"> <li>• Select a sheltered site; avoid long and narrow (&lt;6 m) streets; position houses in a staggered way rather than in rows; create wind breaks by planting trees, hedges etc.;</li> <li>• Make buildings heavy, so it is more difficult for the wind to blow them away;</li> <li>• Use a compact shape, with low walls, to present minimum obstruction to winds;</li> <li>• a hipped roof, pitched at 30-45°, with small eaves to prevent uplift; avoid gables, as they may be pushed inwards;</li> <li>• If a veranda is required, separate veranda frame and covering from the main roof;</li> <li>• Tie roofing sheets well to the roof frame; flying sheets can be lethal; in the case of gci sheet roofing, provide overlaps of 2.5 corrugation, and closer spaced 'U' bolts along ridges and external walls;</li> <li>• Reinforce structural connections with 'hurricane straps';</li> <li>• Make solid foundations, well anchored to the ground;</li> <li>• Provide strong structural joints and fixings, especially between walls and foundations, and walls and roof; use diagonal bracing;</li> <li>• Give walls a rough finish to reduce wind suction;</li> <li>• Position openings centrally and away from corners and intersections; provide openings on both sides of rooms, so that the wind can eventually pass through, rather than lift the roof;</li> <li>• Ensure all windows can be closed; avoid louvres - if they are essential, provide storm shutters or board them up before storms.</li> </ul>	<ul style="list-style-type: none"> <li>• Select a solid site; avoid landfills, flood plains and steep slopes;</li> <li>• Make buildings light to reduce the horizontal forces caused by earthquakes;</li> <li>• Make roofs light to avoid them pushing walls sideways and falling-in on people;</li> <li>• Design compact buildings with a symmetrical shape and closely spaced walls in both directions. If that cannot be done, design them in separate blocks;</li> <li>• Separate adjacent small buildings by at least 75 mm;</li> <li>• Avoid gables, they may fall inwards;</li> <li>• If buildings have more than one floor, opt for similar floor shapes and designs;</li> <li>• Position the foundations on rock or firm soil, avoid stepped foundations;</li> <li>• Provide strong joints between structural components; use a ring beam and a plinth beam where possible; use bracing at corners;</li> <li>• If masonry walls are used, create good bond especially at corners and intersections;</li> <li>• If concrete pillars are used, lap vertical reinforcements mid way between floors and not just above floors;</li> <li>• Keep openings to a minimum, well distributed over the building and within walls; keep them centrally positioned, at least 60 cm away from the inside of corners and intersections and from the nearest other opening</li> </ul>
Designing to cope with floods	Designing to cope with landslides
<ul style="list-style-type: none"> <li>• Avoid sites close to rivers and other waterways that are known to flood;</li> <li>• Provide for good site drainage and good waste management, as waste may block waterways;</li> <li>• Plan for measures, such as small dams or gabions that can reduce the speed of water;</li> <li>• Plan any new infrastructure very carefully. Some, such as road or railway embankments, may have devastating effects by re-directing flood waters;</li> <li>• Lift buildings onto stilts or raised platforms - where the latter is used, a larger platform for a cluster of houses is preferable over single platforms, to reduce the effect of erosion;</li> <li>• Provide deep foundations that keep buildings in place even in strong currents, eventually include a ring beam at plinth level. The minimum depth should be 600 mm in solid soils - if stones are used, select angular, not round ones;</li> <li>• Avoid the use of soil in foundations or walls that may be reached by flood waters. These lower sections of walls should be made of more durable materials that can resist the shocks of debris floating in water;</li> <li>• Protect organic materials such as timber and bamboo from the effects of humidity.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid building on steep slopes do not make steep cuts in slopes to make space for infrastructure or housing; keep any cuts shallow, as steep cuts may become unstable;</li> <li>• Drain slopes well, as they can become unstable and lose bearing capacity when soaked. For the same reason, avoid the use of soakaways, e.g. for sanitary systems or used household water, on slopes. Use stepped drains to reduce the speed of downward flow of water;</li> <li>• Avoid blocking natural drainage ways with buildings or infrastructure;</li> <li>• Avoid stepped buildings where possible; create terraces for small buildings, but avoid deep cuts and fills; keep any infill at the lower end to a minimum, and stabilise this well;</li> <li>• Foresee retaining walls to retain the slope above terraces, and any infill at the lower end;</li> <li>• Reduce erosion by planting appropriate vegetation on slopes.</li> </ul>

that we can learn a lot about participatory design. Essentially, in participatory design, architects and residents jointly design a dwelling that is culturally and climatically appropriate. The architects, although giving up their traditional lead role and professional responsibility, assist and technically guide residents, CBOs and their local builders, on disaster-resistant design.

## Where and when to use participatory design?

Participatory design can be used to develop plans for individual households, but this approach is not necessarily as effective in meeting the needs of large target groups. In non-disaster situations, participatory design is generally used by architects working with communities, e.g. in a street, apartment block, or an organised group of people who want to build anew or turn an existing building into houses, but the key is in striking a balance between these individual needs and plans, and the needs of the community. Often the result is the development of a number of standard house plans, from which community members then can choose. This method could be applied to reconstruction projects.

It is possible, however, to incorporate a degree of flexibility in order to respond to individual needs. One solution is to jointly decide on the shape, structure and essential internal divisions of a house, but then leave it to the inhabitants to decide on some of the infills and finishes (anything that has no essential structural role, including resisting disasters). The idea of separating “supports” (structure) from “infill” (internal completion) in housing was first suggested by the Dutch architect N. John Habraken (1972), as a way of giving inhabitants a meaningful participatory role in design. Another option is to allow a certain degree of modification of standard house plans, through collaboration of a designer with individual households. The advance of computer-aided design (CAD) has now made this a lot easier, as illustrated by Practical Action’s post-tsunami reconstruction in Sri Lanka. CAD systems, however, are still relatively expensive. Wikipedia provides a comparison of different types of software; see the Resources section.

Participatory design can also be used to design other community buildings, such as community centres, schools; health centres; markets or commercial areas; workshops; communal water and sanitation blocks, etc. This is closely linked with participatory planning (see **PCR Tool 7: Planning with the People**), and is best done immediately after, or even during, the planning process. Whilst planning is mainly concerned with settlement layout, the provision of infrastructure, and the position of house plots, participatory design will



photo © IFRC

Participatory design in Bangladesh

then specify how these plots are to be filled in. The discussion with communities on design needs to address house plans as well as specifications for materials and components. The design group will also need to think about how the houses will be built - by themselves, by local builders or others - as the availability and skills of those builders determine which construction technologies are feasible. Furthermore, they will need to consider whether materials can be salvaged, produced and supplied locally, or have to come from elsewhere. It is important to consider at this stage that using local materials and builders can also serve to rebuild local livelihoods.

Design with communities has limitations. It may be difficult: if a group of disaster-affected people is not really a community, e.g. if they are households prioritised from an official waiting list where it may then be very time consuming for them to build relations and generate sufficient trust for a communal design process to work. Similarly, it can at times be difficult in urban contexts, particularly if these contain much more heterogeneous categories of people. There can also be problems if there is a mixture of tenants and owners and tenure issues cannot be easily resolved or landlords suppress tenants’ right to involvement. These issues may be resolved by dividing such groups into more homogeneous smaller groups for which individual plans can be designed.

## Who needs to be involved?

A participatory development process tends to involve different parties that can be divided into the community to be housed and outsiders who

support the development process. In the case of participatory design, the latter will always include an architect or otherwise suitably qualified designer. This person may be supported by an engineer who can advise on making buildings disaster resistant and on services required, such as water. The outsiders may also include a representative of the agency funding the building(s), and possibly a representative of the local authority. One 'outsider' people should facilitate the design process, and ensure every participant can have a say. It is important not to have too many outsiders, however, as they may dominate discussions.

On behalf of the community, it is important that all sections are represented, but it is not a requirement that every household takes part. It becomes difficult to run a design workshop if there are more than 30 participants, and it is often possible, in relatively homogeneous communities, to develop a series of standard house plans with the participation of less. It is preferable for a community to select its own representatives, unless there are good reasons not to, e.g. if the selection process could be biased. There needs to be sufficient women representation as women's design priorities often differ to those of men. It is also useful to have some older participants who may know more about the history, culture and tradition of housing in the location, and have a memory of previous disasters as well as young participants who have more formal education. Local builders have valuable knowledge of vernacular technologies and designs. It is important to remember that, following a disaster, the proportion of households with missing, ill or disabled members can be much higher than usual; those households may have special design or construction requirements, and therefore need proper representation.

If there are a number of very different sections in a target group – a heterogeneous community a participatory design process can become very difficult, as it may be hard to reach agreement. One solution for such cases is to divide the target group into smaller sub-groups and have a participatory design exercise with each of those. Sometimes, communities decide themselves to form smaller groups; this quite often happens when they decide to organise the construction of clusters of houses themselves, in mutual aid. Such groups tend to accommodate a limited number of households, frequently between about 10 and 30, as the management of larger groups in mutually aided construction is quite complex. In such cases, it may also be preferable to have a participatory design exercise with each of those groups.

## The participatory design process

A participatory process for designing houses in a reconstruction programme needs a good facilitator.

This is not necessarily the architect or engineer, but could be another member of a support agency with the right skills. The process may involve the following steps:

1. *Determine design requirements.* Organise meetings with small groups of people and ask them how they design and build their houses, and use the space in them. If, in a separate needs assessment (see PCR **Tool 4, Assessment of Reconstruction Needs and Resources**), people have listed economic activities, seasonal calendars, or daily activities, it is useful to bring these into the discussion too, as these can highlight livelihood and other activities that may have to be accommodated in or around the house. Distinguish the activities and needs of men and women.
2. *Discuss disaster resistance.* Ask the groups what they normally do to protect their houses from natural hazards. Have some houses received less damage than others during the recent disaster? Why do people think this is so? Can some of the local designs and construction technologies be retained for reconstruction? Would they have to be improved? (see PCR **Tool 3, Learning from Disasters**).
3. *People produce sketches.* Ask the groups to produce some outlines of how their houses might look like using pens and papers (or even lines in the soil, they could be photographed to retain the sketches). Ask them to think about what they would like to retain from their traditional house types. Aim to get approximate floor plans for a ground floor and any upper storeys (if there is a need for those). If some people can draw well, they could be asked to produce elevations too. It can be helpful to give names to the rooms, and write in them what activities take place there. The facilitator should keep in mind that producing a vast number of drawings would create a lot of work and time; experience tells us that five or six type designs are sufficient for most locations, and that people rarely select more than three out of those. This may mean that compromises have to be reached between groups over some details.
4. *Groups produce models.* Groups use the sketches to produce housing models, using wood, hardboard, plastic, canvas etc. Models of individual houses should not be smaller than one twentieth of the real size. People can make some changes to the sketch plans on the models, as the purpose of the modelling is to create a clearer picture and encourage further discussion. Any changes made on the models should be marked on the sketches too. The facilitator should remind people to include measures to mitigate disasters in the models, as well as the sketches, as discussed in step 2; if there are no appropriate local disaster-resistant

technologies, the facilitator can bring examples from elsewhere into the discussion.

5. *Decide on materials and construction.* Discuss building material options with the groups. Discuss who is going to build the houses, and whether this influences the choice of materials and technologies, as those preferred builders may have the skills for some, but not others. The facilitator should remind the groups that the selection of local materials and builders will help to rebuild local livelihoods.
6. *Consult the wider community.* Give the group participants the opportunity to take the house models to the wider community; this may result in some further changes to models and sketches.
7. *Finalise designs.* Organise a final meeting with the community groups, to deal with final clarifications and questions. The architect then uses the models and sketches to produce architectural drawings. He or she should show these to the groups, explain how the original models and sketches were used to produce the drawings and answer any questions. Some further modifications to the drawings may have to be made as a result. If the architect is able to use computer-aided design (CAD) that would speed up any subsequent modifications, and could also allow for some individual design needs to be accommodated later on. The Auto-CAD software, in fact, can show designs in three dimensions, which suits participation better than two-dimensional drawings. People's suggestions can be entered on the house image almost instantly, allowing them to consider a much wider range of options, before making a choice. Auto-CAD could therefore also replace step 4: Modelling, though it might make step 6: Wider Consultation more difficult.
8. *Produce construction manuals.* The architect, engineer, or other qualified person, should produce a basic construction manual for each of the approved designs, using a language that can be understood by residents and their local builders. This will show and explain construction details, with emphasis on the disaster-resistant components, component specifications, materials to be used and their bills of quantity.
9. *Build demonstration houses.* Organise the construction of at least one house of each of the types designed. This provides an opportunity to pilot test the drawings and manuals and to train builders and community members. It will also be a final chance to give feedback and make some last changes to drawings and manuals. It is sometimes useful to leave the demonstration houses only partially completed for a while to show important construction details that could otherwise be hidden, particularly if these are

essential to achieve disaster resistance. They could serve another purpose whilst the larger reconstruction programme is ongoing, e.g. as meeting or training space, site office or materials store, but would have to be completed towards the end, to be fit for occupancy as a dwelling.

## Applications

True participatory design in reconstruction is still relatively rare. More commonly, architects will visit some of the disaster locations, but not all communities; talk to selected people, more often leaders or key informants, and less often women or minorities; and observe some of the damage done, if it is still visible. They may get additional information from the agency funding the reconstruction programme, and will produce drawings on that basis. If reconstruction is to take place through an owner-driven approach, the architects may later come back to the communities to explain the plans, for community members to be able to make a selection. But there is rarely much scope for modifications at this stage.

What follows are a few examples of true participatory design in reconstruction of resettlements that have a positive impact on community participants, e.g. in mitigating future disaster risks, increasing community cohesion and cooperation, and in enabling them to recover their livelihoods more quickly. There are many more examples of successful participatory design in normal housing or upgrading projects; the *Resources section* includes some selected references to them.

## Acknowledgements

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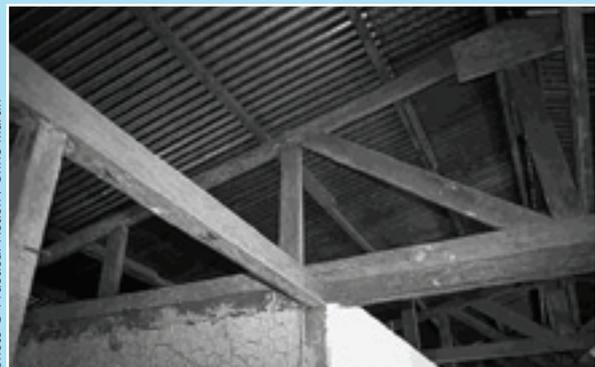
## Case 1: Design with 'improved *quincha*' for increased earthquake protection in Peru

In the Alto Mayo earthquake of 1990 many houses built with *tapial* (rammed earth) or adobe collapsed, or were damaged. Many of the people who had built with these technologies had migrated into the Alto Mayo from Cajamarca, where the earthquake risk is less, but continued to use the technologies they knew. The NGO Practical Action (then called ITDG) realised a safer way of building was needed to mitigate the risk of future earthquakes. Local people initially wanted to rebuild with modern materials, such as bricks and reinforced concrete, but it was soon realised that its cost was a constraint. Given the limited external support generally poor income level, it would have been only possible to help few households rebuild. It was observed, though, that another local technology, *quincha* (consisting of a pole or sawn timber frame, with cane panels and mud plaster, sometimes finished with a mortar), had performed a lot better during the quake. Practical Action started a reconstruction project in the small town of Soritor, which had strong community based organisations; from there, the work spread to surrounding rural areas and other towns. It gathered people's opinions about reconstruction at community meetings. Drawings, manuals, videos and photographs of other housing projects were shown to get people to think about and discuss the types of housing they would want to reconstruct. People began to accept *quincha* as an option, but it was accepted that some improvements needed to be made to it, including embedding the poles in concrete footings, preservation of the timber, and stronger connections of key structural elements. It was then decided to use this *improved quincha* to build a community centre in Soritor. Thus, community members and local builders learned how to build with the technology and got to accept it.



Community centre in Soritor during construction

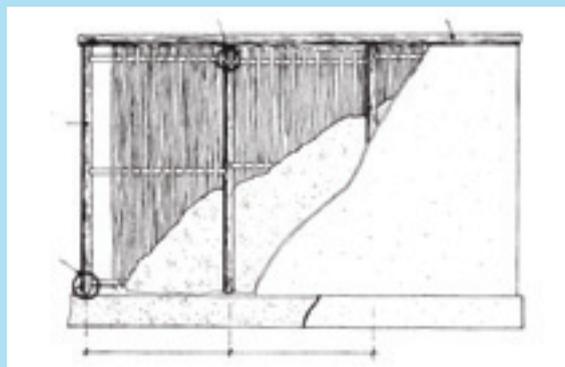
photo © Practical Action / Rumi Velaciaga



Careful jointing between columns and beams improves structural integrity

photo © Practical Action / Chris Martin

Following that, Practical Action organised meetings with small groups of local people to design and model houses, using wooden bricks of several colours. An architect drew up house plans from people's drawings and models, and finalised those plans with the communities. People used the plans and the community spirit generated by the participatory process to construct in groups, assisted by builders trained on the community centre. They were also contributing the materials they could source locally, such as gravel, sand, timber and bamboo, while Practical Action and Caritas provided galvanised iron sheeting – and later on locally produced micro-concrete roofing tiles – nails and cement to families with low incomes, identified by the community. The community centre and early houses perfectly withstood another earthquake, a year later, which helped their popularity and as a result the technology spread well beyond the original project.



Side elevation of a core house

design © Practical Action / Duval Zambrano

This project directly supported the reconstruction of around 800 houses in improved *quincha*. An evaluation nearly two years later found that several thousands of houses had been built using improved *quincha* or a variation of it. The lesson is that the NGO's intervention is not the only force driving technology change. People's needs, knowledge and technical capacity, local resources, political and personal agendas are all factors promoting change and technology development. Innovations in *quincha* technology are no exception. The improved *quincha* housing promoted by Practical Action and its partners can be seen widely in the Alto Mayo, but it differs in design and detailing, reflecting the materials, skills and individual priorities of the owners and builders.

In practical development projects it would be easy to imagine that the end product is the main goal: the end product needs to be a comfortable, affordable and safe house. However, the way in which you work towards that practical goal can have an important impact on people's lives. Practical Action Latin America's staff and partners showed the need and ability for patience, flexibility and perseverance; people processes are complex. The NGO seeks to ensure control of the agenda remains with the community and to work in partnership, ensuring people understand the choices they are making and developing their long-term technological capacity.

See: Lowe (1997) and Practical Action (undated) in the Resources section.

### Case 2: Post-tsunami participatory design in Tamil Nadu

The coastal districts of Nagapattinam and Kanyakumari in Tamil Nadu were the most devastated by the 2004 tsunami in India. Many thousands of people were killed or injured, and of the survivors many had lost their homes and livelihoods, and were displaced to camps and other sites. An Indian NGO, Swayam Shikshan Prayog (SSP), with experience in helping women's groups and local communities recover after the Maharashtra earthquake of 1993, and the Gujarat earthquake of 2001 began working in the region. Characteristics of SSP's support to communities in their recovery include continuity from the relief phase to reconstruction, and the use of learning exchanges between communities. In doing so, they support many activities, and by the time reconstruction starts, they have good relationships with and trust of communities. While many people were still in camps, people in Poompuhar decided they needed a community shelter, as the emergency shelters that had been provided became uncomfortably hot in intense sun, and flooded during heavy rains. This was to be both a meeting place and a place to stay in hot weather or during heavy rains. The women wanted a place where they could meet and organise activities. SSP asked the women to produce a design for the centre they wanted. It then produced finished architectural drawings of the centre that closely matched the women's ideas. The women also supervised the construction of the centre. Meanwhile, SSP organised some improvements to the emergency shelters and used this as an opportunity to train local builders. To start the rebuilding of permanent houses, SSP proposed the construction of a demonstration house in Poompuhar village. People discussed the layout of rooms in the house and how houses can be vulnerable to disasters. They also proposed that the layout and positioning of the houses would need to be determined according to Vaastu (Hindu) principles. A technical organisation, the People's Science Institute, also participated in the discussions between SSP and women's group leaders. It drew up the plans for the model house. SSP also organised training of local masons and builders before and during the construction of the model house. This focused in particular on disaster resistant construction; training included building with stabilised soil blocks, interlocking blocks, different types of masonry bonds, ferrocement construction and roof and floor tiling. The project also included components of disseminating safer construction, treated in more detail in PCR **Tool Communicating Better Building**.

A key lesson from this project was that communities often learn most from other communities that have undergone a similar experience. In this case, the NGO facilitated learning exchanges between women groups from Maharashtra and Gujarat, who had been affected by earlier disasters. This assisted the affected women from Tamil Nadu to move from disaster to development and to take charge of that process, to incorporate disaster risk reduction and preparedness, to develop disaster safe shelter and related services through participatory design, to explore alternate livelihoods, and to strengthen social networks. These initial visits helped to assess the needs and plan for their solutions. The NGO then supported further visits to assist with the ensuing development activities.

See: SSP (2005) and NIDM (2006) in the Resources section.

### Case 3: Participatory design of post-tsunami housing in Sri Lanka

The NGO Practical Action supported many coastal communities in South and East Sri Lanka in their recovery after the 2004 tsunami, through a multi-faceted approach. The reconstruction of housing was a major component in that. Practical Action did not build houses itself, but supported households and communities, and smaller local NGOs working with them, to do so. In doing so, it raised people's awareness about house designs and elements that can help mitigate natural disasters, so that people themselves would give high priority to building houses that are considered safe. Participatory design was an important part of this process. The NGO organised meetings with coastal communities, and asked them to make drawings in the sand of how their houses looked like before the disaster, and to discuss these. Many people were able to make coherent drawings of their houses that were useful for the architects, but some needed help. It was apparent that people with the same cultural background set out and used rooms and spaces in a similar way. This made it easier for the architect to draw up plans and to offer only a limited number of options in a particular location. The architect produced drawings using CAD, and then presented these to the community for final amendments and approval. The type plans that resulted were then sometimes further modified in minor ways, to accommodate individual households' needs; using CAD this was relatively easy to do.

Some of the insights that emerged from this participatory design process, and which donor-driven reconstruction often failed to address included:

- Many people still used biomass for cooking, and needed a stove that could accommodate that fuel; this was incorporated and a chimney added to extract smoke from the kitchen;
- Many people had a strong preference for a lean-to veranda;
- Most people wanted a toilet away from the house and from the kitchen, where most DDR incorporated it;
- Participatory design as able to accommodate women's and men's needs;
- Some people wanted flat roofs, instead of sloping ones, to have somewhere to escape to from floods, so some houses were designed with a flat concrete roof;
- Some people wanted space for livelihoods activities, including shops, workshops and storage space, and this could be taken into account;
- Some settlements included a mixture of Hindus, Buddhists, Muslims or Christians, and these often use space differently; this affected the orientation of houses, the use of space for religious purposes, e.g. as shrines and places for prayer; participatory design enabled such differences to be taken on board.

See: Building and Social Housing Foundation (2008), UNISDR (2007) and Practical Action South Asia (undated) in the Resources section.



photo © Practical Action / Lucy Stevens

The owners of these houses, built in Matara with support of Practical Action, were involved in participatory design. The owner of the left house was able to add some of his own resources and build a slightly bigger house; using CAD, it was easy to adjust the plans

#### Case 4: Participatory design for permanent settlement of the Maasai, Kenya

The Maasai of Southern Kenya and adjoining parts of Tanzania are pastoralists who traditionally have a semi-nomadic way of life. They live in temporary housing, largely made of poles, sticks and soil, where the women and children remain, whilst the men roam with their herds in search of water and grazing. After a year or two, they might move to a new site, take the wood with them, and simply reconstruct the houses on that new site. This was made possible because land was communally owned. However, this way of existence was threatened in Kenya, because others were taking the land and registering it in their names, forcing the Maasai into ever smaller territories, or cutting off traditional grazing routes. By the late 1980's, some of the Maasai started to lay claim on and register their own territories, either in the name of groups or individuals. With that came a wish for more permanent settlement, and thus more durable housing. At that point, the Organisation of Dutch Volunteers (SNV) who was working with the Maasai on livelihoods issues called in Practical Action to help with the housing. In the early 1990's, Practical Action worked together with Maasai women, who are the traditional house builders, to develop a series of house designs. The women produced sketches of layouts and discussed potential technologies. Plans were then drawn up by local draughtsmen. The housing options presented ultimately ranged from an improved traditional house (made higher, with larger windows, and a ferro-cement skin on the earth roof), which was the lowest-cost option, to those with stabilised soil block walls and a micro-concrete tile roof, which was the costliest. Ferro-cement water jars were also introduced for water catchment from roofs, as access to water in the area can be difficult. And smoke hoods and better ventilation were introduced to evacuate smoke from indoor kitchens. Local women and some builders were trained in all these technologies, and built several hundred houses. Some of them were able to continue to build houses for their communities afterwards as a small business.



photo © Practical Action / Nick Hall

Practical action programme managers from Peru and Zimbabwe working with local staff and Maasai women on participatory house design



photo © Practical Action / Alison Doig

Improved traditional Maasai housing

An impact assessment of this project showed that over half of house owners reached continued to improve their housing. Housing improvements have made a noticeable positive impact on health. The process of joint design and implementation had considerably improved the capacity of women individually and collectively. Women trained by the project have gone on to train others. Some are producing materials for sale, and artisans involved in the project have also found new markets. The reduction in time spent by women repairing roofs or fetching water has enabled them to undertake additional productive activities and increase their incomes. There is an increasing awareness of housing issues and the options available to address them. Women are now more confident to negotiate with authorities, and many women's groups members now sit on a range of development committees.

See: Building and Social Housing Foundation (2004) and Practical Action (undated) in the Resources section.

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