
**LECTURE SERIES ON BUILDING SAFER HOUSES
IN RURAL BANGLADESH
NUMBER 1**

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PREFACE

Bangladesh University of Engineering and Technology (BUET) and the University of Exeter, UK, have been collaborating since 1996 to conduct practical research into affordable technologies that can help those most in need of better homes. Later, in 1998, a Higher Educational Link (HEL) funded by the UK Department for International Development and managed by the British Council was formally initiated between these two institutions. The BUET-Exeter HEL focuses on developing and promoting hazard-resistant technologies which are appropriate, affordable and implementable by rural Bangladeshi homeowners and craftsmen. Link activities include research into traditional building materials and methods, the behaviour of non-engineered rural houses subjected to natural hazards and the application of that research through community-based development programme. The collaboration has supported laboratory and field studies, resulting in improved understanding of (a) the engineering properties of natural building materials, (b) the behaviour of non-engineered structures, (c) the processes by which low-income homes are procured, and (d) the socio-economic options available to rural home-owners. The link has also resulted in the publication of two books titled *Implementing Hazard-Resistant Housing* and *Affordable Village Building Technologies*, and *Building for Safety* Leaflet Series.

This set of notes is the first of a Lecture Series on Building Safer Houses in Rural Bangladesh. It describes the BUET-Exeter programme experiences. It has been produced to provide tertiary-level technology lecturers with source material for a presentation outlining the parameters which govern technology transfer at the grass-roots. Few mainstream engineering courses can afford the time to devote a module to this subject; it is hoped that these notes and the accompanying CD-ROM will be found useful when delivered as part of general or introductory courses. The CD-ROM contains all the presentation materials of this volume and can be launched using Microsoft PowerPoint. Lecture materials and overhead transparencies can be printed straight from the CD-ROM, as well.

Robert Hodgson and Salek M Seraj, Editors

Communicating Housing Technologies in Low-Income Areas

INTRODUCTION

The Higher Education link between the Bangladesh University of Engineering and Technology, BUET, and the University of Exeter, UK, was set up to research affordable technologies for improving village homes in Bangladesh. An important part of that process is the raising of awareness among engineers and scientists of the many complex issues which impinge on this process. This introductory lecture has been produced to give non-specialist lecturers a set of resource material for a single presentation that can be delivered within general modules in a busy timetable. Depending on the presenter's prior knowledge of the subject, this presentation might be modified to cover one or two sessions of one hour.

OHP 1 : Title

The author and the Housing and Hazards Group.

Dr Robert Hodgson is a UK-chartered civil engineer and is the Exeter coordinator of the BUET-Exeter link. He is also a specialist in disaster relief and mitigation having been a member of RedR, Engineers for Disaster Relief since its formation in 1980. Dr Hodgson grew up in a rural UK community near Exeter, in south west England. His long associations with Bangladesh started with his first evaluation of post-disaster housing there made in 1990. He also has links with community development programmes in many parts of SE Asia and Africa through the UK charity Devon Aid which he helped to found in 1986.

The Housing and Hazards Group, based in Exeter, includes academics and practising engineers and geoscientists with the common aim of making affordable, hazard-resistant homes available worldwide. The Bangladesh research and the link with BUET are the first practical outcomes of the group's activities.

Housing and Hazards In Bangladesh

A Role for Engineers and Scientists in
Communicating Technologies for Development
in Low-Income Area

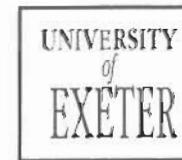
Dr. Robert Hodgson
University of Exeter

Lecture Prepared as an activity of the Higher Education Link
between Bangladesh University of Engineering & Technology
and the University of Exeter.

Programme Funded By DFID and Managed By British Council.



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OHP 2: A PENNY FOR YOUR THOUGHTS

This story can be modified or personalised.

40 or 50 years ago, before there were modern communications or many people with cars, most English villages were fairly self-contained. The modern concept of care in the community had not been developed but, in effect, that is what happened for vulnerable people like the elderly, the orphans and so on.

Bert was such a person. He would now be described as “educationally challenged” or whatever the current buzz-phrase may be. In those days, it was “mazed”. Bert used to sit beside the pub in the village square on sunny days and kindly people would buy him occasional drinks and generally look after him.

Sometimes they might play little tricks. A favourite was to get a packet of crisps to see if he would eat the little packet of salt they used to have in them. Another was “A penny for your thoughts, Bert”.

They’d come out after a couple of drinks and hold out two coins. “‘Ere, Bert”, they’d say, “A penny for your thoughts. You can chose which you want”. In those days, a penny was a large coin that weighed heavily in your pocket while a sixpence was tiny and usual rolled into cracks in the floor. They would hold out one of each.

“Ar, Thankee Sur”, Bert would invariably reply, “I’ll take that bigun”, and they would go back inside laughing that poor old Bert didn’t know the difference between sixpence and a penny.

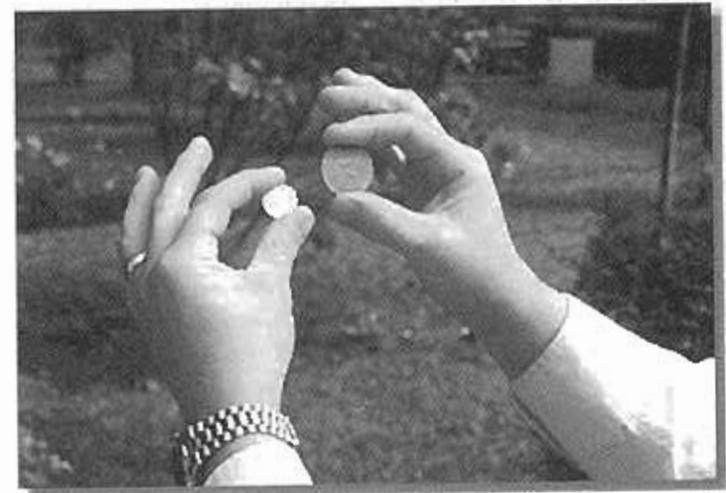
One day a young lad who’d seen this before asked Bert innocently whether it was true that he didn’t know that the sixpence was more valuable. Bert sighed. “Yes, Boy, I knows that. But, if I ever took the sixpence, they’d never play the game again and then I would have nothing!”

Well, poverty alleviation is often like that. We know to whom we want to give the penny and they also know it. However, we pretend to give them choices and make them jump through hoops in order to get it.

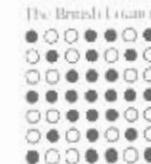
This lecture describes a programme which aims to give real choices to real people so that they can take control over technologies that can improve their lives.

That is much more difficult than it sounds because it requires flexibility and an ability to listen to people’s needs.

A PENNY FOR YOUR THOUGHTS, BERT!



**REAL CHOICES TO REAL PEOPLE TO HELP THEM
TAKE CONTROL OF TECHNOLOGIES THAT CAN
IMPROVE THEIR LIVES.**



2. BANGLADESH : LEARNING TO LIVE WITH IT

Floods and cyclones are natural phenomena. Bangladesh is also close to a seismic belt. It is not possible to prevent such phenomena, as has been attempted with flood banks, for example, in the past. People need help to learn how to live with them.

Mohamed Yunus, the charismatic founder of Grameen Bank who pioneered unsecured credit for villagers, has said:
"In a disaster-prone country like this, disaster preparedness should be a 365-days-a-year job. Natural disasters, floods, cyclones and earthquakes are not the only disasters. Poverty is also a disaster."

Poverty makes people more vulnerable to natural phenomena and is thus part of the disaster.

OHP 3 : FLOODS

Every year, the monsoon rains blow in from the Bay of Bengal and drop on Bangladesh and India, bringing life-giving water to make Bangladesh one of the most fertile places in the world. Every year, the major rivers of the Brahmaputra (locally called the Jamuna) and the Ganges (Padma) break their banks in a more or less predictable pattern. Some years additional rainfall or a coincidence of the rain with high tides produces abnormal floods. Since over 90% of the country is within 30m of sea level, a small increase in water level affects many extra people and results disproportionate damage. This map shows the extent of the 1998 flooding which was possibly the worst in living memory.

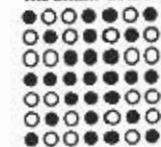
MAP SHOWING EXTENT OF FLOODS IN BANGLADESH DURING THE SUMMER OF 1998



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OHP 4 : CYCLONES

This second map shows the track of the cyclone that struck SE Bangladesh on April 29th 1991, killing 140,000.

The term cyclone is derived from the Greek word "Kyklos", meaning "coil of snakes". Violent winds circulate at high velocities, in this case up to 225k/h. In fact, no one knows the true wind speeds in this case as the instrumentation was all destroyed. Tropical cyclones commonly form over the warm waters of tropical seas and are also known as typhoons in the far east and hurricanes in the Atlantic/Caribbean areas. The tornado is a related phenomenon with even higher wind speeds but much more local impact, typically affecting tracks of up to 20km by 2km wide.

The Bay of Bengal gives rise to several cyclones annually, many of which make landfall in Bangladesh. The 1991 cyclone was the second most destructive in living memory, the worst having occurred in November 1970. The cyclone had two components which caused damage: the winds destroyed flimsy buildings but the majority of the deaths were by drowning in the 6m high pressure surge wave which the cyclone pushed onto the coast. This wave reflected from some low hills about 5km inland and sucked many people to their deaths in the Bay.



MAP SHOWING TRACK OF 1991 CYCLONE



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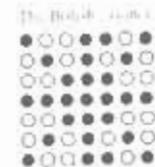


PHOTOS
OF
DAMAGE
SUSTAINED
DURING
1991 CYCLONE



OHP 5: EXAMPLES OF DAMAGE

These photos show typical views of the total destruction caused by the cyclone. However, even amidst this destruction, some homes survived. Some were sheltered by trees or topography; some were more strongly built; a critical factor was whether the house bore the full effects of the surge wave.



OHP 6 : CHOICES

Hodgson and Whaites (1993) report a study of the long term effects of the 1991 cyclone which was made in January 1992, 9 months after it had struck. By that time, most people had almost managed to forget the terrifying night and most of the destruction had been rebuilt. It was hard to piece together real-life experiences.

This man and his family, pictured beside their rebuilt home, were able to recall a lot. They heard the cyclone warnings that had been broadcast by radio and by loudspeakers but they did not heed them because similar warnings had been issued on about 15 previous occasions without any resulting cyclone. There was a bigger risk that, in abandoning their home, it would become easy prey to robbers. This response was common.

At about 10pm the wind became very strong and they realised that a calamity was approaching. He took one child in each arm and, with his wife, hurried to a relative's house about 500m away. This recently built mud-walled house (second photo) was its owner's retirement investment. It sheltered most of the village's survivors that night.

The next morning, they emerged to find that their home was totally destroyed and about 0.5m of floodwater had destroyed all their food and possessions. The man is a boatman: he earns a living carrying goods up and down the creeks. Fearfully, he approached the mooring to find a gaping hole in his main asset.

Everything was gone: home, food and source of income. What to do? His wife did not want to live with in-laws but he convinced her that a source of income was more important. They borrowed \$125 (six months earnings) at 10% interest per month from a moneylender. They spent a third on replacing food and household assets and the remainder on repairs to the boat.

Later, a non-governmental organisation (NGO) donated 16 sheets of iron plus \$12 to help repair the house. Unfortunately, the money was not enough to complete the job. The last thing that you do when building a house is to fix on the roof. If you run out of money, you don't do that and this roof was very vulnerable to future winds. However, the man expressed himself satisfied. He had both boat and roof. Of course, no one could persuade him to say that the boat was more important to him since the survey was being made by the same NGO that had donated the roof. He denied emphatically that relief from the crippling debt would be more desirable than the roof sheets (which had a similar value). However, this case showed clearly how important it is to be able to give people real choices over their survival strategies.

Hodgson, R L P and Whaites, A (1993). The rehabilitation of housing after natural disasters in Bangladesh. In *Natural Disasters, Protecting vulnerable communities*, edited by Merriman and Browitt, Thomas Telford, pp374-387

CHOICES



CYCLONE VICTIM



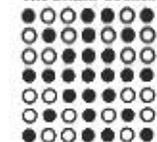
VILLAGE HOUSE
WHICH SURVIVED



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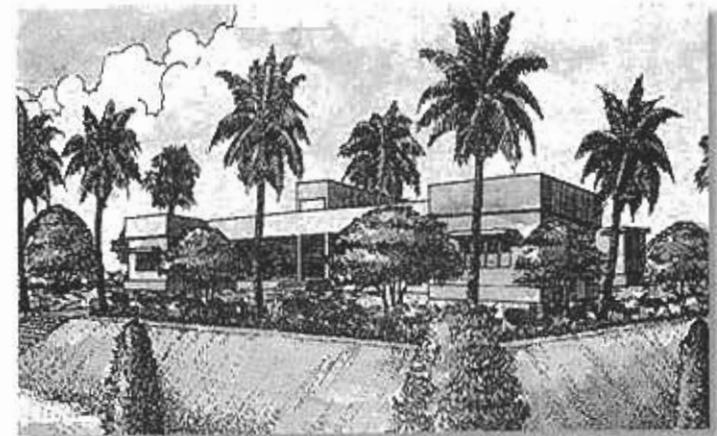
OHP 7: CYCLONE SHELTERS

Cyclone shelters had been built in the affected area but there were not many. A programme of construction of shelters had been initiated after the 1970 cyclone. However, as there had been no cyclone affecting this area since then, the programme faltered and many shelters were either not completed or not maintained.

Most survivors sheltered in strong buildings near their homes, like the previous example and like these people who sheltered on this school building. This observation has led the Government of Bangladesh (GoB) to set up the Multi-Purpose Cyclone Shelter programme which has developed designs for raised buildings that can be multi-use. Most will be used as schools. Since it is important to maintain livestock and other livelihoods, many, like this design, will have safe areas around them for protection of animals. 2,500 new shelters are planned to give local protection to coastal dwellers. This is a good example of engineers and planners listening to and taking heed of the needs of the vulnerable.



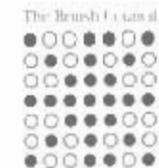
VILLAGE SCHOOLS ACTED AS CYCLONE SHELTERS



NEW SHELTERS WILL ALSO BE USED AS SCHOOLS



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3. VILLAGE HOUSING AS IT EXISTS NOW

The lessons from the cyclone studies is that technical solutions can readily be found but they need to be communicated in such a way that they are used and valued.

OHP 8: A TYPICAL GROUP OF VILLAGE HOUSES

This photo shows a fairly typical group of village houses. You can see a range of different house styles and building materials. Some have iron roofs; some are thatched. Some have mud walls; some have bamboo or jute-stick walls. Some roofs are pitched while some are flat. All types and materials coexist side by side.

Different homeowners have chosen differing building styles according to their means and skills. For example, mud walls are more expensive than bamboo yet the rickshaw puller (a low status job) in this village has mud walls. He can transport the mud himself and avoid the major cost of mud construction.

TECHNOLOGICAL SOLUTIONS CAN BE READILY FOUND BUT HOW CAN THEY BE COMMUNICATED SO THAT THEY ARE APPROPRIATE AND VALUED ?



TYPICAL VILLAGE SCENE.

OHP 9: SURVEY DATA

This shows the results of a survey of 54 houses in one village in northern Bangladesh (Hodgson & Carter, 2000).

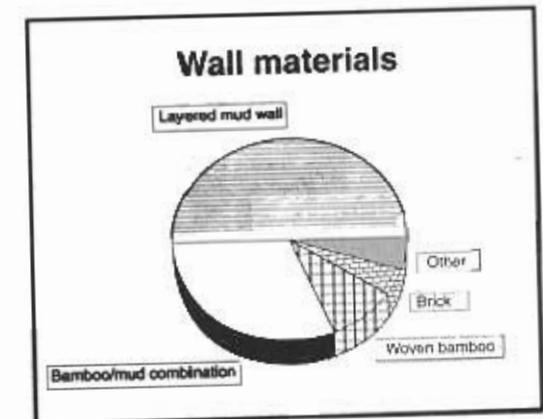
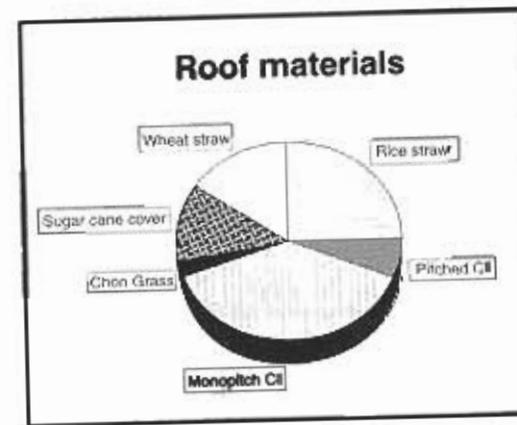
Broadly, just over half the houses have thatched roofs. This group can be subdivided into four different straw types. Most of the rest have flat iron sheet roofs and there are a few with better, pitched iron sheet roofs. In this area, half the houses have mud walls, a further third have mud plastered onto bamboo and the rest of the poor houses have bamboo mat walls. There are a few with brick or iron sheet walls.

According to World Bank statistics (Choudhury, 2000), a very similar pattern is obtained if you take an overall view of Bangladeshi rural homes. This mix of house-types is fairly typical.

There is therefore no point in developing a single solution to the needs and aspirations of each person in the country, or even all in a single village. It will not (does not) satisfy everyone. What people need are choices to help them do things in their own preferred ways.

Hodgson, R L P and Carter, M L (2000). Some Factors governing choices of building materials in rural Bangladesh. In *Affordable Village Building Technologies, Proceedings of the Second Housing and Hazards International Seminar held in Dhaka, Bangladesh, 6-8 February 1999*, edited by Seraj, Hodgson and Choudhury, pp. 87-97.

Choudhury, J R (2000). Building for safety in Bangladesh. In *Affordable Village Building Technologies, Proceedings of the Second Housing and Hazards International Seminar held in Dhaka, Bangladesh, 6-8 February 1999*, edited by Seraj, Hodgson and Choudhury, pp. 11-13.



A RANGE OF CONSTRUCTION MATERIALS AND TYPES WILL BE PRESENT WITHIN ANY GIVEN COMMUNITY.

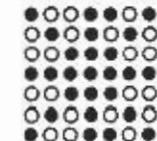
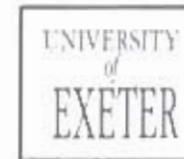




EVEN IN LOW HAZARD AREAS, WINDS AND FLOODS MAY STRIKE AT ANY TIME.

OHP 10: TYPICAL DAMAGE IN WINDS

Although major cyclones and floods affect many people at once, there will be local winds and rain somewhere in the country every year and even the north, traditionally thought free of floods, gets hit from time to time. This shows the results of a mini cyclone on iron sheet/bamboo structures.



**POOR MAINTENANCE COMMONLY CONTRIBUTES
TO HOUSE DAMAGE AS IN THIS EXAMPLE**

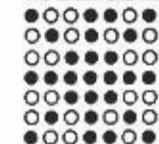


OHP 11 : LACK OF MAINTENANCE

Not all damage results from specific hazards. This building succumbed to natural decay which rotted the bottoms of the main posts so that a strong gust of wind could easily blow it over.

This outcome could have been easily prevented by initially treating the posts, replacing the damaged posts in good time and/or inserting cross-bracing to stabilise the structure. All these are relatively inexpensive and would have saved a lot of expense in dismantling the roof and rebuilding. Why were they not done?

It looks simple, but the issues are complex



OHP 12 : VULNERABILITY TO PRICES

It is commonly asked: "Why are not the traditional house forms, which have been used for generations, not adequate for the present generation?" That is a fair question and needs addressing.

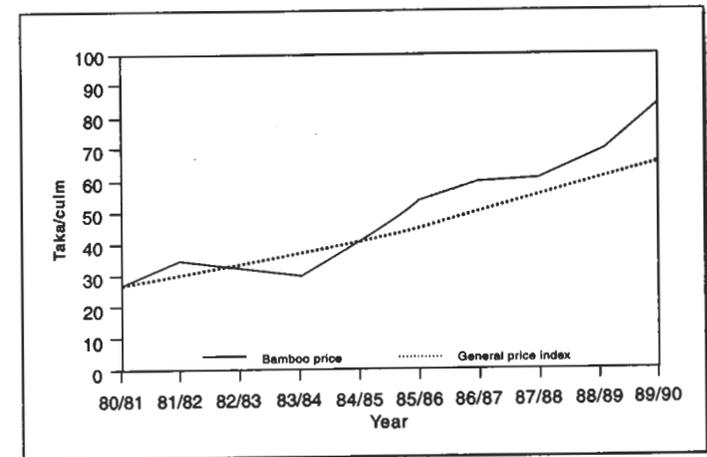
Vulnerability to natural hazards is increasing in rural Bangladesh for various reasons. Pressure of population plus the need to put more good land to agriculture means that ever more people can only live on river banks and in coastal areas, which puts them in harms way. Resolution of that problem requires political will and is beyond scientists.

This chart illustrates another aspect of those pressures on the land. Almost all of low-lying Bangladesh is now under rice cultivation and the country is at last self-sufficient in food. However, this reduces the availability of bamboo (and other natural materials) and the cost escalates. Throughout the 1980s the cost of bamboo rose faster than the general price index (Ahmed, 1999). This trend has continued through the 1990s.

A generation ago, house builders could almost pluck their needs from the forests. Now, most of those forests no longer exist and rebuilding a home has significant costs attached. Those involved may not have noticed this creeping disaster of inflation - but they do know that they are getting poorer with each disaster.

Ahmed, I (1999). Hazard-resistant construction technology for rural housing in Bangladesh: Reinforced concrete posts. In *Implementing Hazard-Resistant Housing, Proceedings of the First International Housing and Hazards Workshop to Explore Practical Building for Safety Solutions held in Dhaka, Bangladesh, 3-5 December 1996*, edited by Hodgson, Seraj and Choudhury, pp. 39-52.

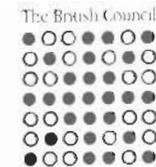
VULNERABILITY TO PRICES



THE PRICE OF BAMBOO (AND OTHER NATURAL MATERIALS) RISES FASTER THAN INFLATION, YEAR ON YEAR POOR PEOPLE BECOME POORER.



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4. EXPERIENCES FROM PREVIOUS WORK

Many attempts have been made to bring better homes to low-income communities over the past 30 years. Most have concentrated on the technologies at the expense of sociology and have had, at the best, limited success. This section outlines some relevant experiences and observations from Bangladesh.

OHP 13: ENGINEERED SOLUTIONS

The Bangladesh National House-building Research Institute in Dhaka has been working on the problem of hazard-resistant housing for many years. Here are two examples.

The first is a floating home that can be resited after the flood. I would be interested to know how you find it again. Its value as a demonstration building must be limited by the fact that it floats in a cess-pool.

The second is raised on high stilts to avoid the surge waves and floods. This creates significant hazards for any small children who may live in it.

Both these examples are made of reinforced concrete and both are very expensive compared with a typical village home. Neither has been widely used, possibly ever used. People who cannot afford the rising price of bamboo certainly cannot afford these and, if they were given them, would be tempted to sell them to wealthier neighbours to realise the asset that they would represent.

Despite these and many other similar examples, research institutes around the world continue to develop inappropriate and unaffordable "solutions" to low-cost housing.

ENGINEERED SOLUTIONS



EXAMPLES OF INNOVATIVE HOUSE DESIGNS AT THE NATIONAL HOUSE BUILDING RESEARCH INSTITUTE, DHAKA



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OHP 14: HIGH TECH POST-DISASTER SHELTERS

Most post-disaster shelter is constructed by survivors on a self-help basis. Ready made post-disaster shelters are commonly very expensive and usually not available when needed. This is one example which has had a promising initial trial.

It is called the Permatent. It has the form of a tent and is made from profiled steel sheet. It has three sections with canvas end-flaps. The sections can be stored on a horizontal pole and delivered by light pick-up trucks.

The Permatent is designed for reuse and is only economical if it can be reused some 10 to 20 times. To do this requires good communication with possible victims before the event as most victims are unlikely to return willingly what they thought was a gift. However, initial trials showed a good rate of recovery after the first deployment. It seems that life in a Permatent is hot and uncomfortable. Users were happy to return them having survived the initial few months after a disaster and rebuilt their own, more comfortable assets.

POST DISASTER SHELTER



THE PERMATENT HAS BEEN DESIGNED FOR RAPID DEPLOYMENT DURING EMERGENCY PERIODS.

OHP 15: HOUSING CREDIT. THE GRAMEEN PROGRAMME

Grameen (meaning "rural") Bank has a programme of small-scale credit programmes throughout Bangladesh. Once savers have proved their reliability, they can become eligible for loans to build a house. This enables them to build a house costing about 3 to 4 times as much as a normal one. The design is more or less specified with concrete corner posts and iron roof. About half a million such houses have been built over 10 to 12 years.

This programme has been successful but has some draw-backs :

The poorest people do not qualify for loans;

The house design is specified, allowing little opportunity for personalising it to suit individual needs;

There are now many similar credit programmes and most borrowers have a choice of lender. It is thus easy to become overstretched financially and lose everything.

Housing & Hazard's studies show that many people would prefer some form of insurance (peace of mind) to credit (Recommendations of Seraj, Hodgson & Choudhury, 2000). However, to set up insurance it is necessary to create and enforce standards.

Seraj, S M, Hodgson, R L P and Choudhury J R (2000). Affordable Village Building Technologies, The proceedings of the 2nd Dhaka Housing & Hazards International Seminar, 1999, BUET/Housing & Hazards Group, 164pp.

HOUSING CREDIT



GRAMEEN BANK HAVE PIONEERED THE USE OF CREDIT TO ENABLE VILLAGERS TO CONSTRUCT STRONG HOMES TO A PRESCRIBED DESIGN.

OHP 16: CONSTRAINTS ON TECHNOLOGY TRANSFER FOR HOUSING

There are various reasons why improved housing technologies are not readily embraced by village people. These are some of them.

Most people are occupied with staying alive. They earn small wages (typically 40 taka or 50 pence per day), have to work in the fields at busy times and so on. Any dissemination programme must fit into the annual cycle of events.

Insecurity of tenure. Some people do not own the land on which they live and may be evicted at any time. Others live on river banks subject to erosion. Such people will be loth to invest in good homes.

Often, people feel that as there are many, frequent hazards, there is no point in doing anything.

- 4 The extra cost inhibits many people from improving their homes.
- 5 Knowledge of the options is often patchy and people may be unaware of simple improvements that would help.

As technologists, we must take all these into account if we are to have an lasting impacts.

CONSTRAINTS ON TECHNOLOGY TRANSFER

Most rural people do not regard housing as a priority for one or more of these reasons :

- They have many other calls on their time
- They do not have security of tenure over their homestead site
- There are many hazards and the benefits to be derived from the extra expense seem too marginal
- The cost is too great and/or they have not enough extra money
- They do not have access to the knowledge that could help them through illiteracy or low status.

**TO BE APPRECIATED,
TECHNOLOGICAL IMPROVEMENTS
MUST BE**

- Appropriate
- Accessible
- Available
- Affordable

OHP 17 : TO SUMMARISE

Technological improvements must be

Appropriate,
Accessible (that is, information and materials must be available in local markets)
Affordable

5. COMMUNICATING AT THE GRASS-ROOTS

Affordable materials are of little use if no one knows about them. This section outlines some of the parameters which must be considered if innovations are to be understood and taken up by the people who can benefit most.

OHP 18: ALL SECTORS OF THE COMMUNITY MUST BE INVOLVED

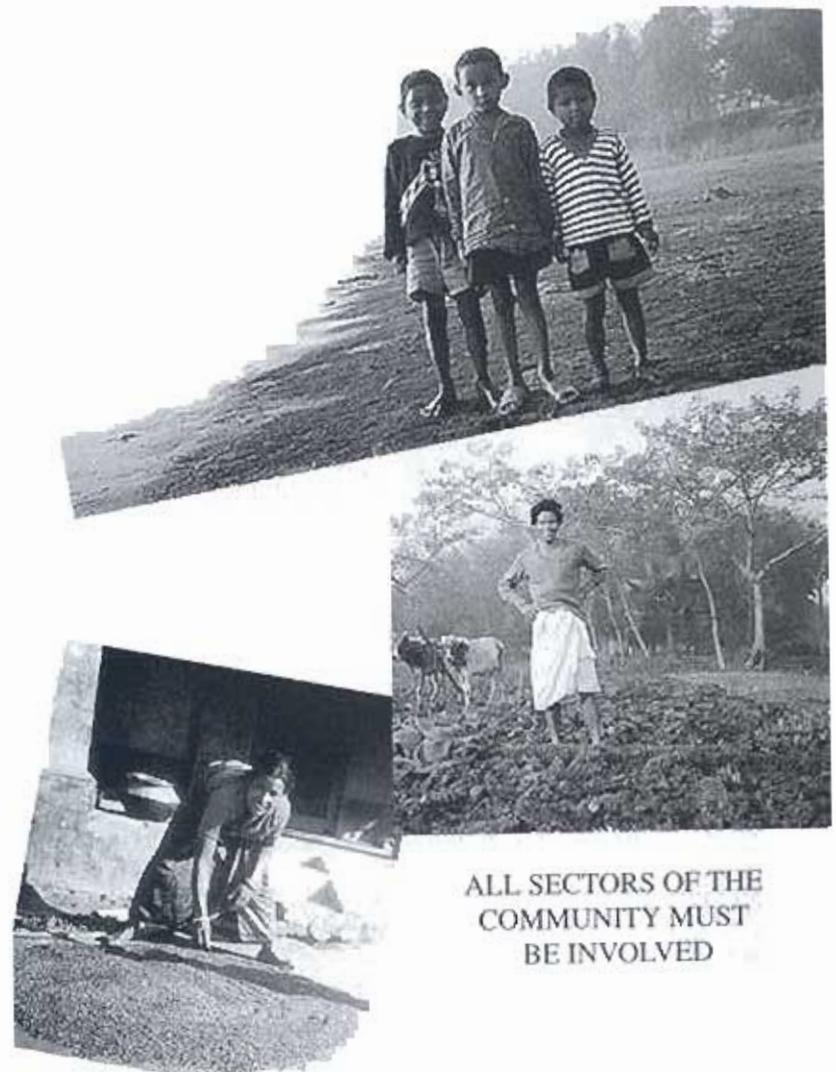
In the case of housing in Bangladesh, everybody is involved in house building. Professional builders exist but poor homeowners cannot afford to employ them. Those who can afford to pay builders like to call the shots and therefore have to be included in the information dissemination process.

Children are the homeowners of the future and much experience in other sectors shows that educating people at an early age results in good retention of the messages and helps to reinforce programmes aimed at parents.

Rural men have a major part in the initial home construction. Traditionally, men do any job requiring tools, although this generalisation breaks down in households headed by women (widows or divorcees) which are often marginalised (Magne, 2000).

The main role of women in the housing process is maintenance of the building fabric. They therefore have a greater interest in owning a durable home than does the man. They may also have to guard the home during times of disaster, putting them at risk.

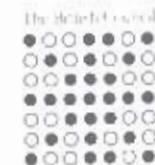
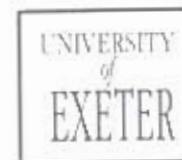
Magne, S A M (2000) Housing & Hazards and the workshop process - realising potential. In Affordable Village Building Technologies, Proceedings of the Second Housing and Hazards International Seminar held in Dhaka, Bangladesh, 6-8 February 1999, edited by Seraj, Hodgson and Choudhury, pp. 99-109.



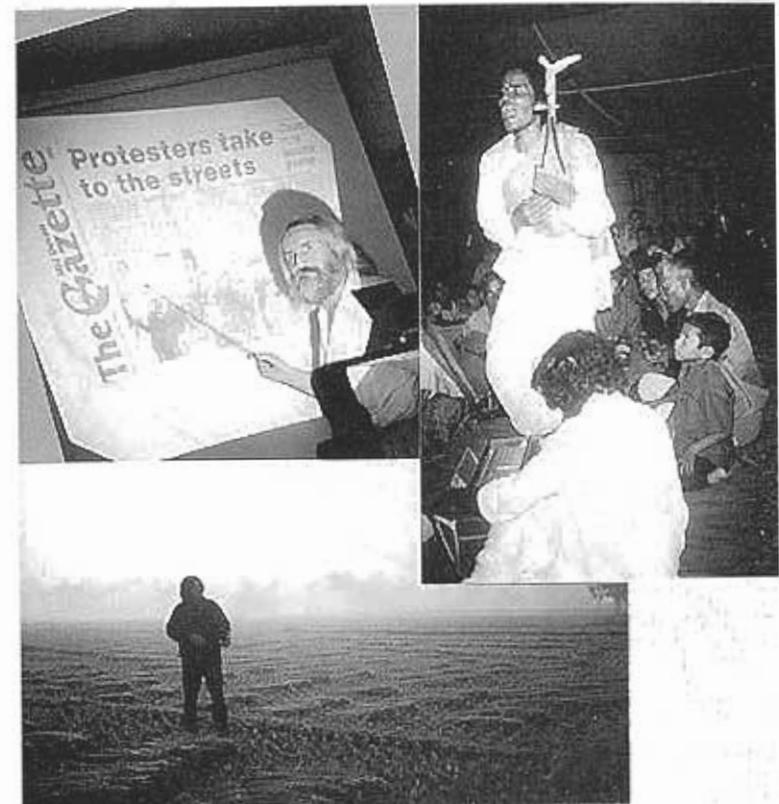
ALL SECTORS OF THE
COMMUNITY MUST
BE INVOLVED



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OHP 19: APPROPRIATE MEDIA FOR AURAL MESSAGES

"Chalk and talk" is effective for literate audiences like this but would be of little interest to the man in the rice-paddy who would soon find more productive things to do.

In the first place, people need something interesting to engage them in the process. Local art-forms can be most valuable in this. The programme in northern Bangladesh developed a song and drama routine using a local group of musicians to deliver building for safety messages. These messages explained that stronger homes saved money and raised awareness of the programme. The routine was performed in public festivals and displays, ensuring that the messages were heard widely.

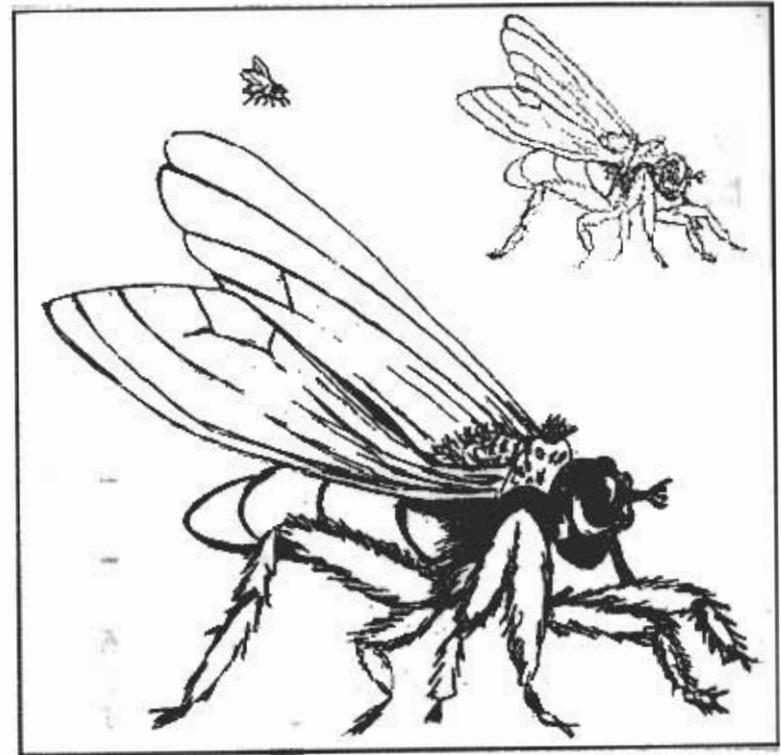
Other art forms may be appropriate in different places.

APPROPRIATE MEDIA ARE NEEDED TO REACH
THE MAN OR WOMAN IN THE PADDY



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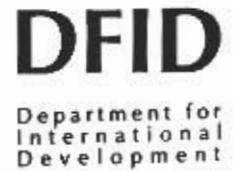


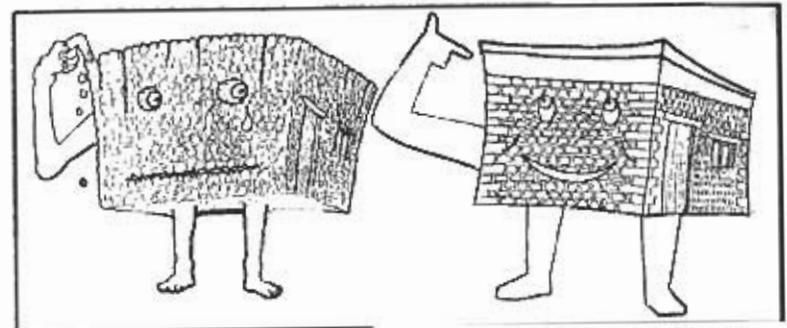


GRAPHICAL REPRESENTATIONS OF PERSPECTIVE
ARE NOT ALWAYS READILY UNDERSTOOD BY
LOW-LITERACY COMMUNITIES.

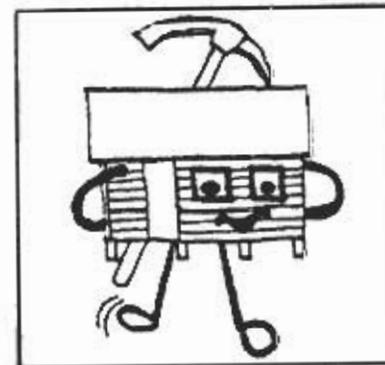
OHP 20: VISUAL MESSAGES: GRAPHICAL REPRESENTATIONS ARE NOT ALWAYS UNDERSTOOD

Many building for safety programmes have experimented with visual messages, often in cartoon form. One should be aware that people who are not literate are usually not able to interpret the norms and conventions of drawings, either. For example, perspective effects are commonly depicted by changing the relative sizes of objects. This may make them unrecognisable, as shown by the following experiment. These 3 drawings of the same fly were shown to villagers in Lesotho (southern Africa). When asked to identify them, the common response was "a fly, a wasp (or bee) and some strange monster". This response can be verified by asking a just pre-literate child anywhere in the world the same question.

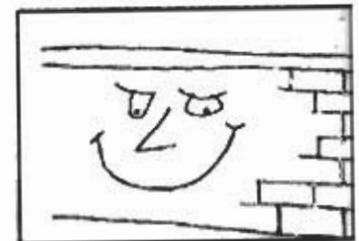




Happy house and sad house go to Pakistan. Or is one a house on stilts with a boat and an electricity meter on the wall and a staircase to the roof?



Happy house goes to Ecuador. Can an audience unfamiliar with drawings be expected to understand this level of abstraction?

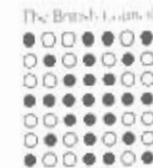


Is this wall in Zimbabwe happy, sinister, or drunk?

EXAMPLES OF CONFUSING DRAWINGS

OHP 21: SOME MORE CONFUSING DRAWINGS...

These other drawings have all been used in housing programmes. Try explaining them to an audience accustomed to only everyday realities.



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OHP 22: REALITIES IN BANGLADESH

Here is an example from Bangladesh. Many people did understand this one but some points are not clear.

- How much should it be burnt? Are these three different options or are all necessary? In fact, it should be the first plus either of the other two.
- Some villagers in northern Bangladesh still use bows and arrows. Are we under attack?
- Why is a woman doing man's work? Does this mean that women must do it? Earlier versions of this drawing showed a man but the depiction was changed in this case for gender correctness.

These all seem like minor quibbles but the effectiveness of this type of material could be lost if any lingering doubts remain in the audiences' minds. Such drawings have to be checked for clarity and local context.



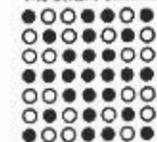
WHY IS A WOMAN DOING MAN'S WORK?



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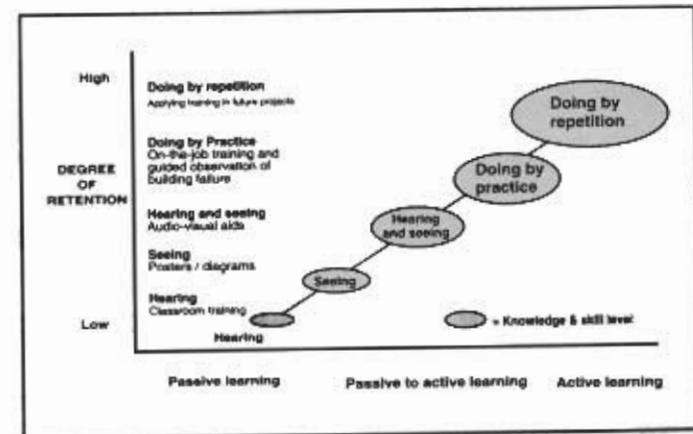
OHP 23 : DOING BY REPETITION

Davis (1999) uses this diagram to illustrate the effectiveness of different learning processes. What he says is that you learn least by hearing someone talk about a subject (passive learning). (I might test this theory tomorrow morning!)

You learn and retain a lot more by seeing something done and doing it yourself results in even better retention of ideas. The best results come from doing and repeating the activity or active learning.

We need a process of dissemination that gets people involved in it actively.

Davis, I (1999). Key issues in building for safety. In *Implementing Hazard-Resistant Housing*, Proceedings of the First International Housing and Hazards Workshop to Explore Practical Building for Safety Solutions held in Dhaka, Bangladesh, 3-5 December 1996, edited by Hodgson, Seraj and Choudhury, pp. 65-68.



REPETITIVE ACTIONS RESULT IN THE BEST LEARNING



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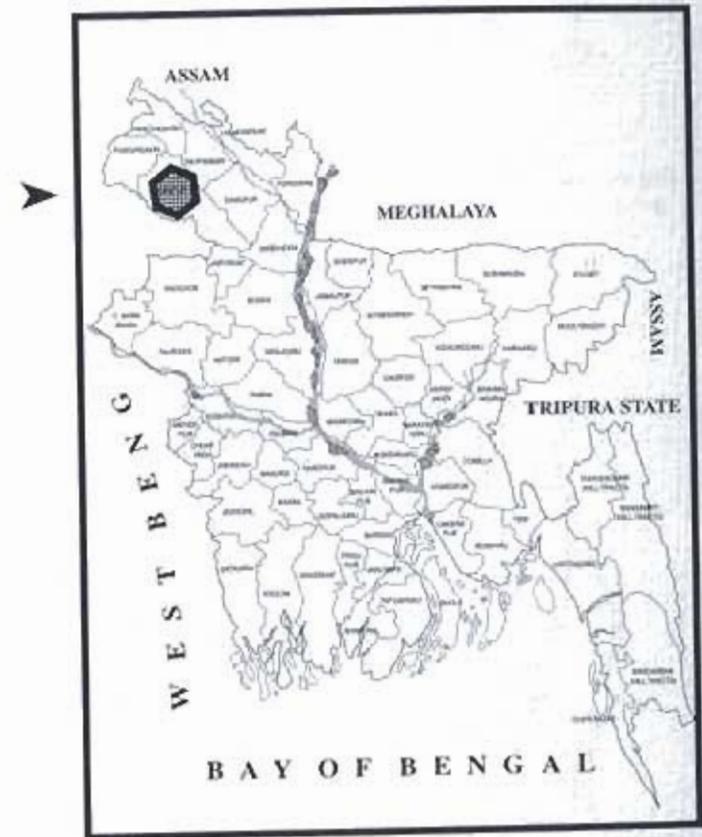
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6. THE FIRST HOUSING & HAZARDS FIELD STUDIES

The Housing and Hazards programme sought to develop such a participatory process. A postgraduate researcher from UK spent 9 months in a village in northern Bangladesh. His brief was to find out how houses are built and to explore ways of building them more strongly. He spent the first two months learning Bengali (known as Bangla in Bangladesh) so that he could communicate with villagers.

OHP 24: LOCATION OF PROJECT

The project was located in Dinajpur District, northern Bangladesh, a seven hour bus journey from Dhaka. This remote area has traditionally suffered a lack of aid of any kind and remains very poor.



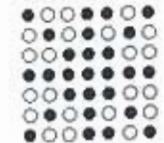
LOCATION OF PROJECT AREA IN NW BANGLADESH



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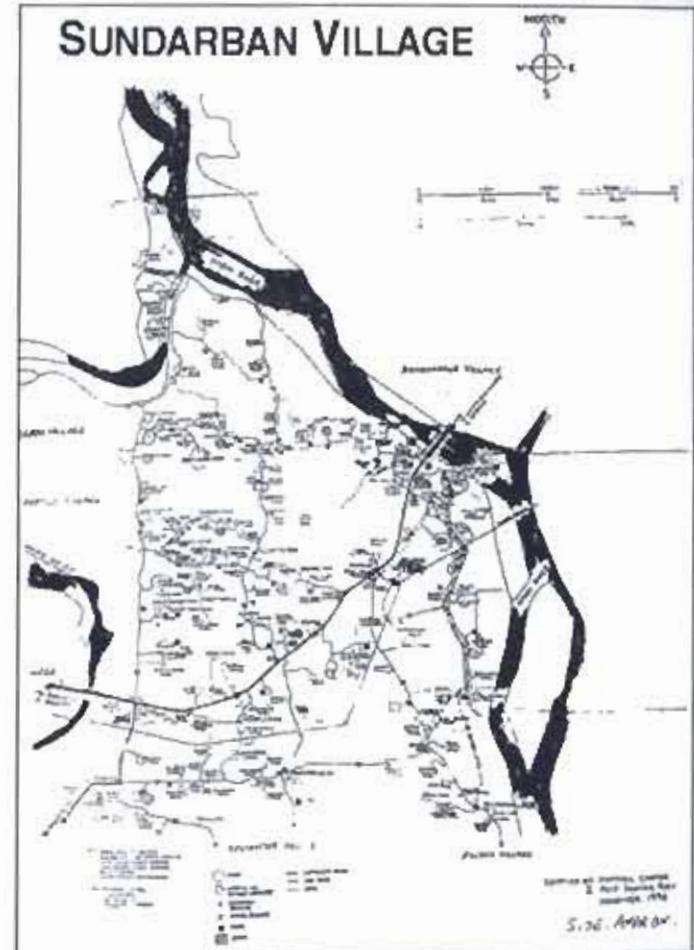
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OHP 25: THE VILLAGE MAP

While familiarising himself with the language, the researcher also familiarised himself with the village. He made a map. This gave him a reason to visit all corners of the village, getting to know people and observing their homes. The mapping led to a small survey of house types (see OHP 9) and set him up for the active learning part of the project.

The village is about 4km across and 5km north-south. It is bounded on two sides by rivers which floods occasionally and is roughly bisected by a main road. Around 7,000 people live in this area which is not special in any significant way.



SURVEYING FOR A VILLAGE MAP ENABLES THE RESEARCHER TO BECOME FAMILIAR WITH THE STUDY AREA.



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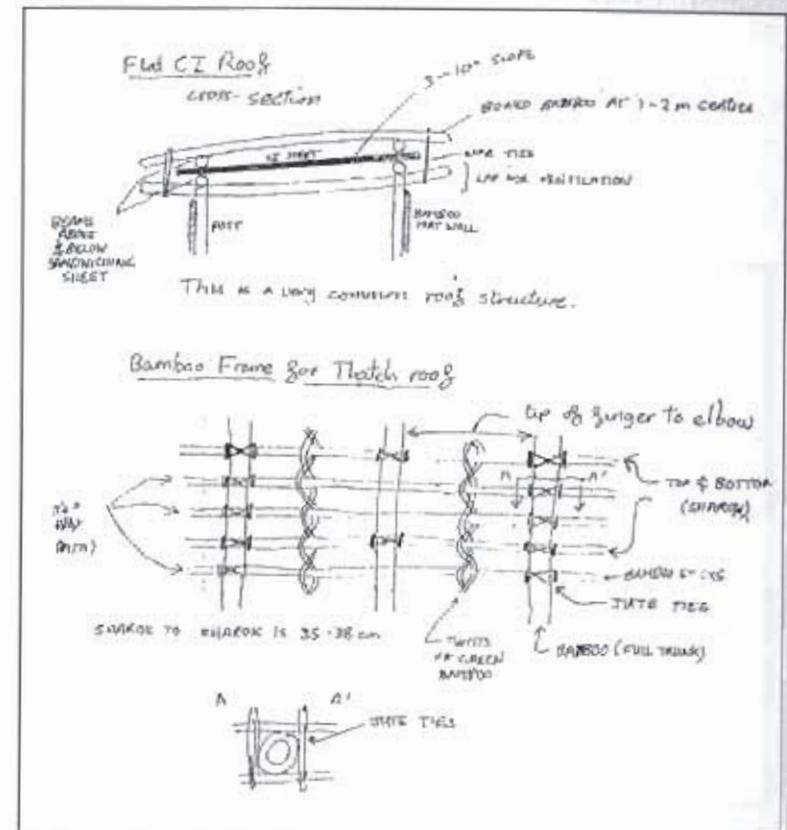
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OHP 26: FIELD NOTES

As he went around, the researcher noted techniques and activities to build up a picture of how homes are put together there.

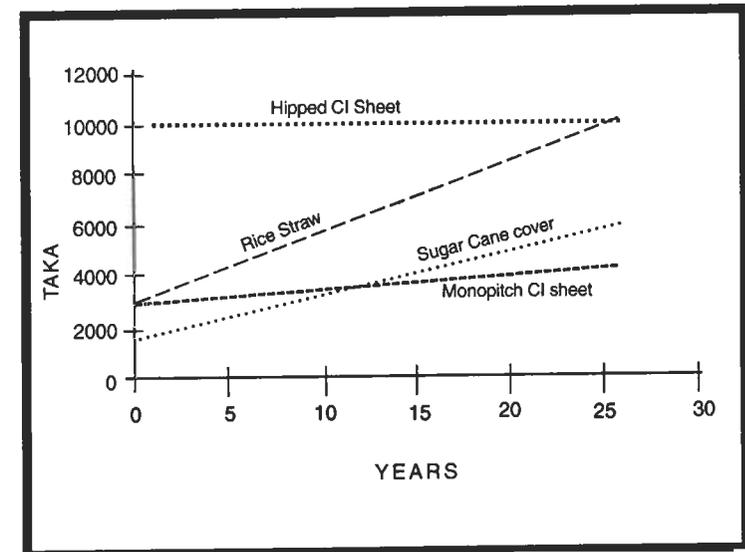
Some of the building methods he saw, such as the "sapra" flat roof structure are not common further south. He noted that the spacing of the rafters varies a bit; this is because it is measured by the length of a forearm and different builders have different lengths of arm.

Having assembled this basic data, the researcher set up a series of Participatory Learning and Action workshops. Some were more for discussion. They started with an introductory session which encouraged participants to discuss their own experiences. It turned out that there was a lot of collective experience of improved building but no mechanism for sharing it with others nearby.



EXAMPLES OF FIELD NOTES



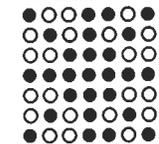


VILLAGERS WERE ENCOURAGED TO CALCULATE LIFE CYCLE COST FOR DIFFERENT MATERIALS TO UNDERSTAND HOW EXPENSIVE MATERIALS COULD BE COST EFFECTIVE OVER TIME

OHP 27: LIFE CYCLE COSTS OF ROOVES

This was another theoretical discussion. Participants calculated the costs of different roof types and estimated their life-cycles. They were surprised to find that a well-made iron roof might be cheaper than a rice-straw one when you calculated the cost over 25 years.

The researchers liked this presentation of long term costings but it had been forgotten completely by the participants even a year later. No one there can afford the luxury of projecting costs over half a life time. A lot can happen in 25 years.



OHP 28: MUD WALL BUILDING EXERCISE

This was one of the practical workshop sessions. Working in seven groups, participants experimented with different ways of preparing mud walls. One group made their piece with no instruction, as they would have done it normally. Others incorporated modifications such as reducing the water content, adding sand or rice husks and so on. A layered mud wall is built in lifts so, in effect, they constructed one lift of a wall.

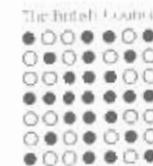
After completion, the walls were left undisturbed to enable the participants to monitor them and evaluate themselves which mixture performed the best. Some mixtures had been chosen by the researcher to give poor performance. In this way, the participants became involved in taking their own decisions.



DIFFERENT MUD MIXTURES WERE TESTED AND EVALUATED.



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BAMBOO TREATMENT WAS DISCUSSED BY
ONE WORKSHOP GROUP

OHP 29: TREATING BAMBOO

Bamboo poles can partly be protected against rot by scorching them and then painting them with Alcatra (bitumen). The scorching drives out sap, on which wood-boring insects feed. This was demonstrated in another workshop on improved bamboo techniques. The sight of sap bubbling from the poles was very well remembered.

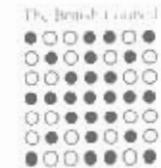


OHP 30: THE DEMONSTRATION BUILDING

People need to be able to evaluate new ideas for themselves. To enable this, a full sized demonstration house was built which incorporated eight improved technologies: poles and other members were treated; walls were cross-braced to prevent sway; roof corners had knee-bracing; an improved roof fixing was used; corner connections were tied with durable wire instead of jute string; a course of bricks was put in the bases of walls to reduce termite attack; and, the plinth used improved mud.

Participants calculated the cost of the improvements. These worked out as 8% of the cost of an unimproved structure. They can now monitor the performance of the building which is used as a training centre by the local NGO.

A FULL SIZED DEMONSTRATION BUILDING
ENABLED LONG TERM EVALUATION OF
THE TECHNIQUES DISCUSSED.



OHP 31: IMPACTS

A study of the medium term impacts of this programme was conducted two years later. There had been no follow-up in the meantime. Several important facts emerged:

35% of participants (14 people) had done some building. Of those, 8 had used improved technologies. There were a further 14 who reported that although their houses had been damaged during the 1998 floods, they were as yet, 9 months later, unable to afford any repairs. Only those doing planned work used more than one workshop idea. Those who had to repair storm damage (quickly) seldom had time or money to incorporate improvements.

The demonstration house was ignored by many because it was seen as too large, a "rich man's house. I could not live in a house like that". The fact that it is structurally identical to their own homes was not considered relevant.

A STUDY MADE 2 YEARS AFTER THE PILOT PROJECT FOUND THE FOLLOWING IMPACTS:

1. "35% of participants (14 people) had done some building. Of those, 8 had used improved technologies. There were a further 14 who reported that although their houses had been damaged during the 1998 floods, they were as yet, 9 months later, unable to afford any repairs."
2. Only people doing planned building work had used more than one improved technology.
3. Those who had to repair storm damage quickly seldom had time or money to incorporate improvements.
4. The demonstration building was ignored by many because of its size. The fact that it was structurally identical to their own smaller homes was not seen as significant.



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7. RAISING AWARENESS OF THE ISSUES

Work such as these field studies will have little impact in isolation. It is necessary to raise awareness among decision makers and senior scientists to create a culture of hazard mitigation. This requires information campaigns and conducting relevant research at levels sufficient to get it noticed by the scientific community.

OHP 32: IT IS NECESSARY TO CONVINCING THE DECISION-MAKERS

Government
Local administration and elites
International donors

and so on all have to play their part to ensure that external factors and policies do not increase the vulnerabilities of the poor. For example, land reforms, however well meant, will usually be seized on by landowners to dispossess people. Flood defences may have a similar effect and local industries may take over land without proper compensation.

COMMUNICATION WITH LOCAL AND NATIONAL DECISION MAKERS

- Government
- Local administrations
- International donors

Is also needed to ensure that policies do not increase the vulnerabilities of the poor through

- Changes to land tenure
- Infrastructure development
- New industries or agriculture, etc.



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OHP 33: NATIONAL SEMINARS

As well as conducting village level research, the Housing and Hazards Group has raised awareness among Dhaka's opinion formers by sponsoring a series of workshops and seminars on village housing issues.

These have been done under the auspices of a British Council-managed Higher Education Link between the Bangladesh University of Engineering and Technology (BUET) and the University of Exeter. The link also incorporates the Grameen Trust for Poverty Alleviation so that outputs of the link can be disseminated directly to the grass-roots.



NATIONAL SEMINARS HELP CREATE AWARENESS OF ISSUES



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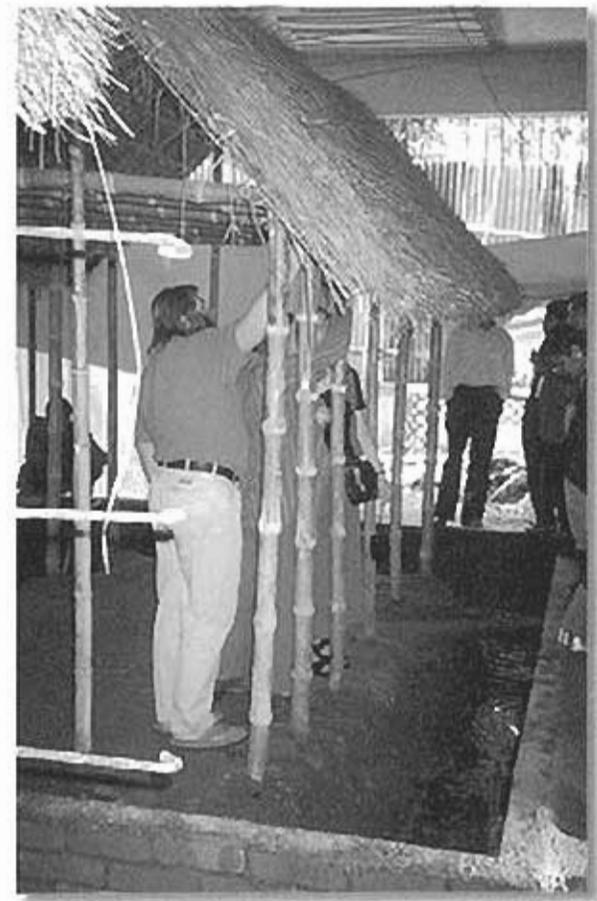


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OHP 34: FULL-SIZED TEST STRUCTURES

BUET's test programme, in collaboration with Sheltech Limited, includes the construction and load testing under controlled conditions of full-sized village houses. This will assist technologists to model such flimsy structures mathematically, will help to demonstrate the issues to opinion formers and may be videoed to demonstrate appropriate principles of structural engineering at the village level.



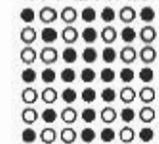
FULL SIZED MODELS ARE USED TO ASSESS STRUCTURAL BEHAVIOUR AND PROVIDE DECISION MARKERS WITH FIRST HAND EXPENSES OF ISSUES.



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OHP 35: WIND TUNNEL TESTING

Exeter's wind tunnel has been used by researchers from BUET to investigate wind loading created by turbulent airflows on flexible huts. The first studies demonstrate that this approach is feasible and further collaborative work is being undertaken. These studies will help in the understanding of technical problems and can also provide visual material for use in grass-roots dissemination campaigns. They also help to inform Exeter undergraduates who are involved through collaborative project studies.



UNIVERSITY OF EXETER'S WIND TUNNEL



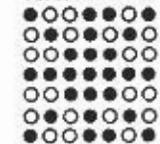
WIND TUNNEL MODELS CAN BE USED TO DEMONSTRATE DYNAMIC EFFECTS.



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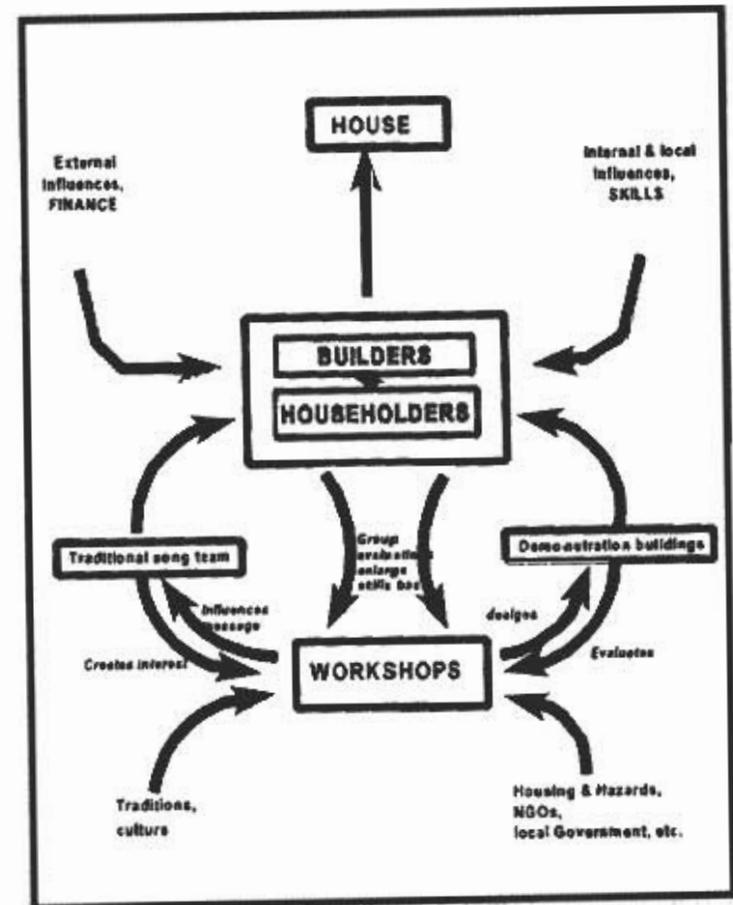
OHP 36: LINKS IN THE HOUSING AND HAZARDS PROCESS

This beetle diagram illustrates the main inputs that go into the improved house, following the Housing and Hazards process. It suggests how the workshops can be used to input traditions and culture as well as research from the BUET programme, NGOs and governmental agencies into feed back loops relating the workshops to the building activities.

It is important to create a cyclical process. The song team (in this example - it might be some other cultural activity) creates interest and feeds new messages to people. Group evaluations create and develop a skills base. The demonstration buildings are used similarly.

There are some external factors outside the control of this process. However, their effects can also enter the feed-back loops between builders and workshops.

This is a model for a complex process. More work is being done to evaluate initial activities and refine the model. The aim is a self-sustaining process.



LINKS AND INPUTS INTO THE VILLAGE BUILDING PROCESS.



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OHP 37: FINALLY, TO SUMMARISE

People must have real choices

Rural populations are becoming more vulnerable to hazards - in Bangladesh, anyway

Communication must be two-way. We have to be seen to listen

Solutions must be sensitive to cultural factors

Learning by doing is more effective than by telling

The process needs to be continuous and cyclical. This requires support in the field.

SUMMARY

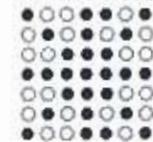
- People must have real choice
- Communication is a two-way process
- Learning by doing is most effective
- Poor people are becoming more vulnerable because of external factors
- Sensitivity to sociological and cultural factors is vital when communicating new methods and techniques.



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