Disaster preparedness and rehabilitation in Binh Tri Thien Province, Vietnam

VIE/85/019

CHUYỂN GIAO KỸ THUẬT XÂY DỰNG NHÀ CHỐNG GIÓ BÃO
DEMONSTRATION OF STORM RESISTANT BUILDING TECHNIQUES

Terminal Report

Final Project Presentation

January 1991

Development Workshop

Viện Thiết Kế Nhà Ở - Công Trình Công Cộng, Hànội
Institute For Housing and Public Building Design
Xí Nghiệp Thiết Kế Khảo Sát Xây Dựng, Huế
Institute For Building Investigation and Design

GRET

Project VIE/85/019 Disaster preparedness and rehabilitation in Binh Tri Thien Zone.

Funding: United Nations Development Programme (UNDP)

Sub-project No 3. Demonstration of storm resistant building techniques

Executing Agency: UNCHS Habitat, Nairobi.

Vietnamese counterparts: Institute of Building Design (IBD), Hué, Vietnam
Institute for Housing & Public Building Design (IHPBD), Hanoi, Vietnam

Sub-contractor: Development Workshop (DW), BP 13, 82110 Lauzerte, France
GRET, 213 rue la Fayette, 75010 Paris, France.

Report Production

Authors: J. Norton, G. Chantry
Photos: J. Norton, G. Chantry
Edition: J. Norton, G. Chantry, C. Gordon, B. Tauran.

Disaster preparedness and rehabilitation in Binh Tri Thien Province, Vietnam

VIE/85/019

CHUYỂN GIAO KỸ THUẬT XÂY DỰNG NHÀ CHỐNG GIÓ BÃO
DEMONSTRATION OF STORM RESISTANT BUILDING TECHNIQUES

Terminal Report

Final Project Presentation

January 1991

Development Workshop

Viện Thiết Kế Nhà Ở - Công Trình Công Cộng, Hànội
Institute For Housing and Public Building Design
Xí Nghiệp Thiết Kế Khảo Sát Xây Dựng, Huế
Institute For Building Investigation and Design

GRET

Contents

1. Summary

1.1 The project

A UNCHS mission was undertaken in March 1986 to the region of Binh Tri Thien Zone following the 1985 typhoons to assess the damage and see how assistance could be provided. The mission highlighted the fact that the most affected buildings - in terms of damage, loss of materials and difficulty in reconstruction - in the Binh Tri Thien Zone were the 'transition' houses - those neither traditional or totally modern, a mixture of whatever materials and techniques people can afford - and small communal buildings. By comparison, traditional buildings survive typhoons much better, and some contemporary larger public facilities survive well too. The frail thatched houses of the poor are rapidly destroyed, but quite quickly repaired as well. The UNCHS mission noted that some technical know how regarding typhoon resistant building techniques existed amongst engineers, but this information was not available to the builders who are the most directly concerned with all types of building. Later observation have shown that moreover, technical information has seldom been really related to the realities of local building in the provinces. The overall objectives of Sub-Project No. 3 were to attempt to address this situation, through the organization of series of housing and small building vulnerability workshops. These workshops were to initiate activities to inform the local authorities and the public about measures that can be taken to reduce the impact of natural disaster on physical structures. At the same time an objective was to assess the feasibility of replication of the programme and the techniques proposed at provincial and national level.

At the invitation of UNCHS, a consortium formed by two NGO's, Development Workshop and GRET (Groupe de Recherche et d'Echanges Technologiques), have undertaken a programme, in collaboration with two local Vietnamese partners, the Institute of Building Design (IBD), Hué, and the Institute for Housing and Public Building Design (IHPBD) Hanoi, to meet these objectives.

The programme has involved workshops for local builders, and in addition workshops and seminars for provincial decision makers and construction technicians, since all of them, albeit in different ways, are concerned with improving the understanding about cyclone resistant construction methods, with their dissemination to the general public, and their application in public and domestic building: concerned in effect with the implementation of an 'Action Plan' for promoting typhoon resistant construction.

The programme has been developed around three main 'workshop' sessions, one in each of the new provinces in Binh Tri Thien Zone:

* the first at Hué and at Phu Loc District in what has now become Thua Thien-Hué province, held in May/June 1989;
* the second at Hai Lam, in Thieu Hay District in Quang Tri province held in December 1989 and (for builders) in February 1990;
* the third at Quang Trach District, Quang Binh Province, in February/March 1990.

1.2 The outputs achieved in the project have been as follow:

1. Three training workshops for builders; three training workshops for technicians; three seminars for decision makers.

2. Three demonstration public buildings completed by September 1990, and a fourth building being programmed for construction in Hué in 1990/1991.

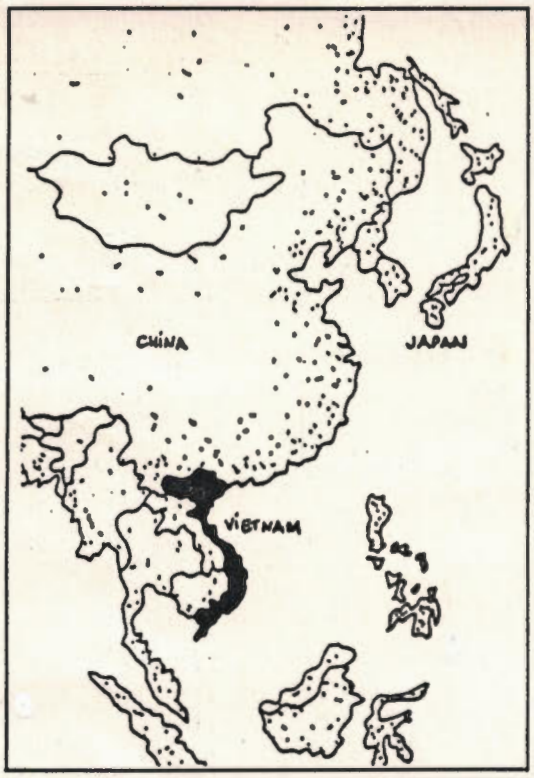
3. Technical dossiers produced for each of three provinces; posters (10,000) and leaflets and folders showing the 10 key points of typhoon resistant construction; a brochure "Housing and cyclones" 2 volumes (see interim workshop dossier); Dossier on basic information on cyclone resistant construction (DW/GRET).

4. More than 36 builders directly involved in workshops; entire teams of builders involved in the construction of the second and third demonstration buildings. In addition, 42 technicians trained directly, and a large number of 'decision makers' informed.

5. One trial public education programme carried out in Phu Loc District; a Provincial Public Education Programme carried out in Thua Thien-Hué in April 1990. Seminars linked to these programmes involving

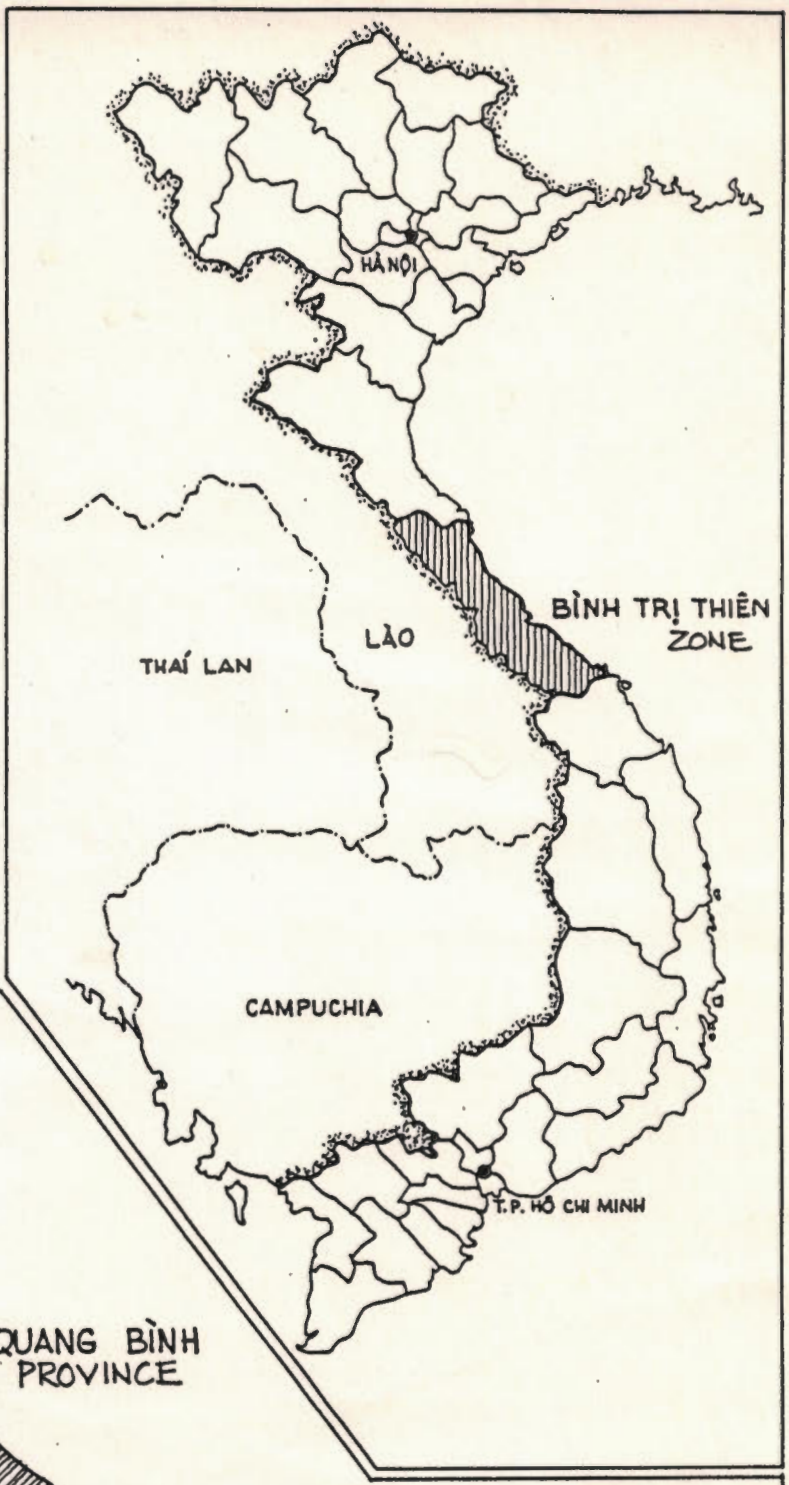
large numbers of government institutions and organizations. Supporting graphic materials including posters and videos produced.

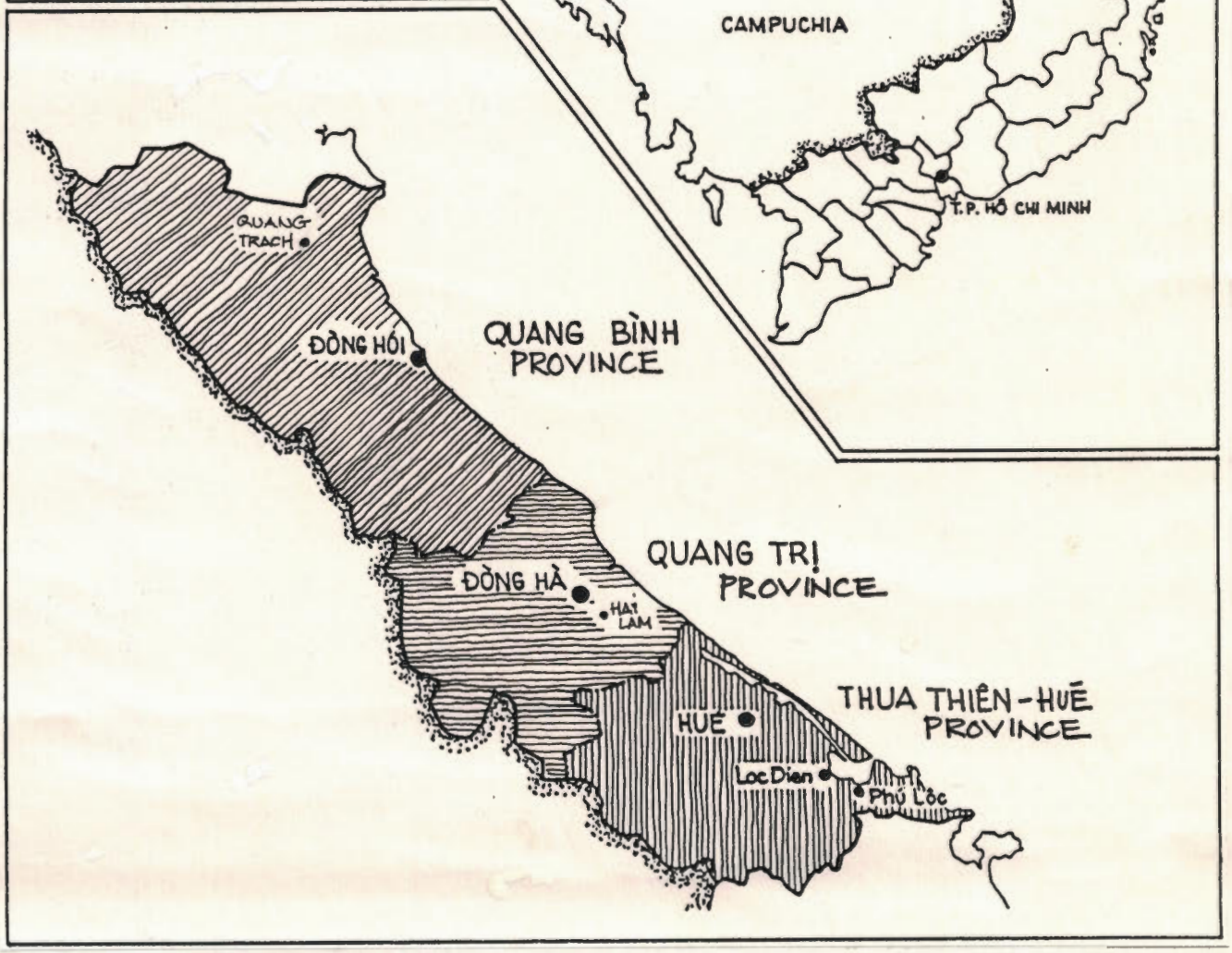
6. Definition of an Action Plan for each province, and implementation of the Action Plan in four provinces: Thua Thien-Hué; Quang Tri; Quang Binh; and Thanh Hoa. A strong institutional capacity developed in Hué (IBD), and an improved capacity in Hanoi (IHPBD).



SINCE JULY 1st 1989, BINH TRI THIEN PROVINCE HAS BEEN DIVIDED INTO THREE NEW PROVINCES :

- QUANG BINH
- QUANG TRI
- THUA THIEN





2. The problems: typhoons and development.

2.1 The overall problem

Almost without fail each year typhoons sweep across the coastal plains of the central and northern areas of Vietnam, leaving behind them a trail of loss of life, massive destruction to property and infrastructure, and wastage of crops. In the aftermath of each typhoon, the population and the authorities mobilize to rehabilitate their region. Scarce resources of materials and money are consumed in the effort of reconstruction and relief: these same resources could be far better used for the development of the region, and in effect the rehabilitation effort acts as a major threat to the region's development efforts and capacities. Reducing the damage would thus make a major contribution to an overall improvement and development of living conditions.

In the case of houses and public buildings of these coastal regions, much of the damage could be reduced, and in the case of minor typhoons even avoided, if only preventive steps were taken to make the buildings stronger and less at risk from typhoon damage. To do so, far less effort and money is required than gets used up in the annual reconstruction effort.

Typhoon - image on one of the ancient brass Dynastic Urns at the Palace in the Forbidden City, Hué.

Damaged thatched houses after a small typhoon.

2.2 The UNCHS assessment mission.

In October 1985 two strong typhoons struck Binh Tri Thien Zone * in the centre of Vietnam. Local authorities reported quite severe damage: 875 persons dead, 49,000 houses destroyed, 230,000 houses damaged, 2,600 classrooms destroyed or damaged, 6 hospitals and 250 health centres damaged. The UNCHS mission undertaken in March 1986 to assess the situation highlighted the fact that the most affected buildings - in terms of damage, loss of materials and difficulty in reconstruction - in the Binh Tri Thien Zone were the 'transition' houses ** - those neither traditional or totally modern, a mixture of whatever materials and techniques people can afford - and small communal buildings. By comparison, traditional buildings survive typhoons much better, and some contemporary larger public facilities survive well too. The frail thatched houses of the poor are rapidly destroyed, but quite quickly repaired as well. The UNCHS mission noted that technical know how existed at the level of engineers both nationally and in the provinces, but that this information was not available to the builders who are the most directly concerned with all types of building. In effect, at the time of the mission, no specific government body or institution was mandated to collect information and prepare designs, guidelines and standards on how to build more disaster resistant houses and small communal buildings.

* Binh Tri Thien Zone was one province until July 1989, when it was divided into the three provinces of Quang Binh, Quang Tri and Thua Thien-Hué. In this report they are collectively referred to as Binh Tri Thien Zone, except where reference is made to one specific new province.

** See Appendix 1 for a description of building in Binh Tri Thien and resistance to typhoons.

2.3 The UNDP programme of Assistance.

After the UNCHS and parallel missions by other UN agencies, and in response to requests form the then province of Binh Tri Thien and the Government of Vietnam, a UNDP proposal was made for a three project package of assistance to the region. This package comprised three sub-projects:

Sub-project No. 1. Improvement of flood / typhoon warning in Binh Tri Thien province";

Sub-project No. 2. Telecommunication facilities for flood forecasting and warning in Binh Tri Thien province.;

Sub-project No. 3. Demonstration of storm resistant building techniques in Binh Tri Thien province".

The contract for the implementation of Sub-project No. 3 was awarded in 1988 to a consortium of two NGO's - Development Workshop (DW) and GRET - who have implemented the programme in collaboration with two Vietnamese counterpart organizations, the Institute of Building Design (IBD), Hué, who have been the principle partners, and the Institute for Housing and Public Building Design (IHPBD) Hanoi.

2.4 The objectives of Sub-Project No.3.

The overall objectives of Sub-Project No. 3 were to attempt to address the situation identified in the UNCHS mission, through the organization of series of housing and small building vulnerability workshops. These workshops were to initiate activities to inform the local authorities and the public about measures that can be taken to reduce the impact of natural disaster on physical structures. At the same time an objective was to assess the feasibility of replication of the programme and the techniques proposed at provincial and national level.

The outputs originally called for were as follows:

1. A series of training workshops for builders on how to build more disaster resistant houses and small buildings.
2. A series of demonstration prototypes, as part of the workshops, and to meet regular government building needs.
3. Simplified, illustrated building manuals for the use of local builders.
4. Better trained local builders in typhoon resistant building techniques.
5. Awareness of other government institutions and departments on housing disaster preparedness, including diversified graphic materials to be utilized in various public education programmes.
6. Provincial and national action plans for the establishment of a permanent capacity to implement a housing and small building vulnerability reduction programme.

(See Appendix 2 for a summary of the outputs)

3. The DW/GRET sub-project approach and outputs.

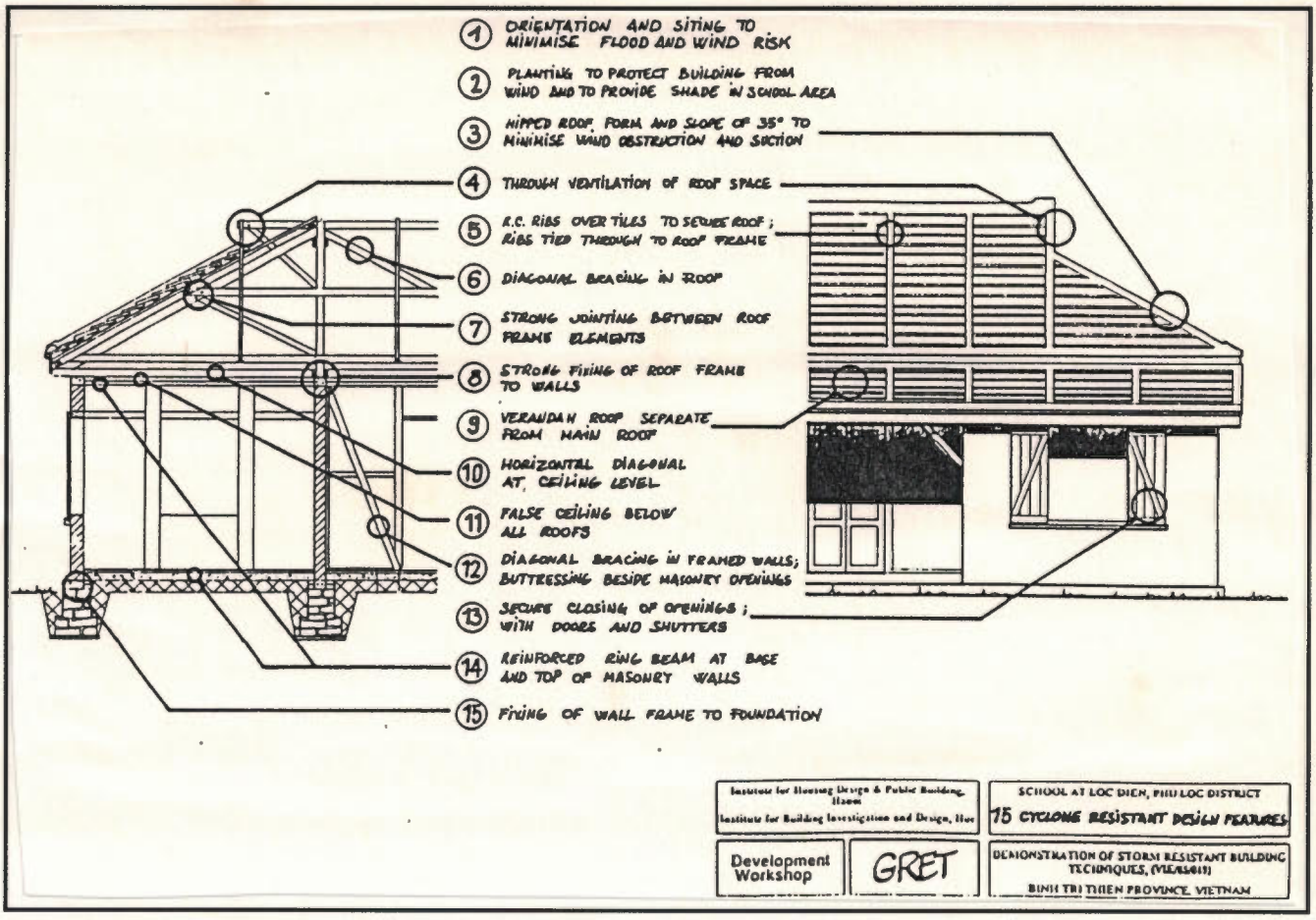
3.1 Overall approach

To meet these objectives, Development Workshop and GRET proposed and have subsequently implemented a programme in Binh Tri Thien which, as well as workshops for local builders, involved workshops and seminars for provincial decision makers and construction technicians, since all of them, albeit in different ways, are concerned with improving the understanding about cyclone resistant construction methods, with their dissemination to the general public, and their application in public and domestic building: concerned in effect with the implementation of an 'Action Plan' for promoting typhoon resistant construction. (For a summary table of achieved outputs see Appendix 2).

The programme has been developed around three main 'workshop' sessions, one in each of the new provinces in Binh Tri Thien Zone:

* the first at Hué and at Phu Loc District in what has now become Thua Thien-Hué province, held in May/June 1989;
* the second at Hai Lam, in Thieu Hay District in Quang Tri province held in December 1989 and (for builders) in February 1990;
* the third at Quang Trach District, Quang Binh Province, in February/March 1990.

Workshop for builders at Hai Lam, Thieu Hay District, February 1990



Box 1. Key cyclone resistant points in a demonstration building.

3.2 The demonstration buildings

Each workshop has been accompanied by the design and construction of a demonstration public building. Builders have been trained both through the practical work on the demonstration buildings and through their participation in workshops *

The first demonstration building was the Loc Dien primary School, Phu Loc District, the second the Hai Lam health centre, Thieu Hay District, and the third a library at Quang Trach. IBD are planning a fourth small building in Hué with the residue of funds for the demonstration building. (see Box 1: Key cyclone resistant points in a demonstration building.)

3.3 Learning through surveys

The programme has been based on developing amongst the participants an appreciation of that which exists already in local building practice, and to establish a link for the participants between the theory of engineered design and standards, rarely applied in local practice, and the realities of building construction in Binh Tri Thien. Thus, the workshop participants have themselves surveyed the local building techniques to identify weakness and potential strengths, basing their survey on ten key points of typhoon resistant construction - proposed by DW/GRET and then debated on by the participants (see Box 2. The Ten Key

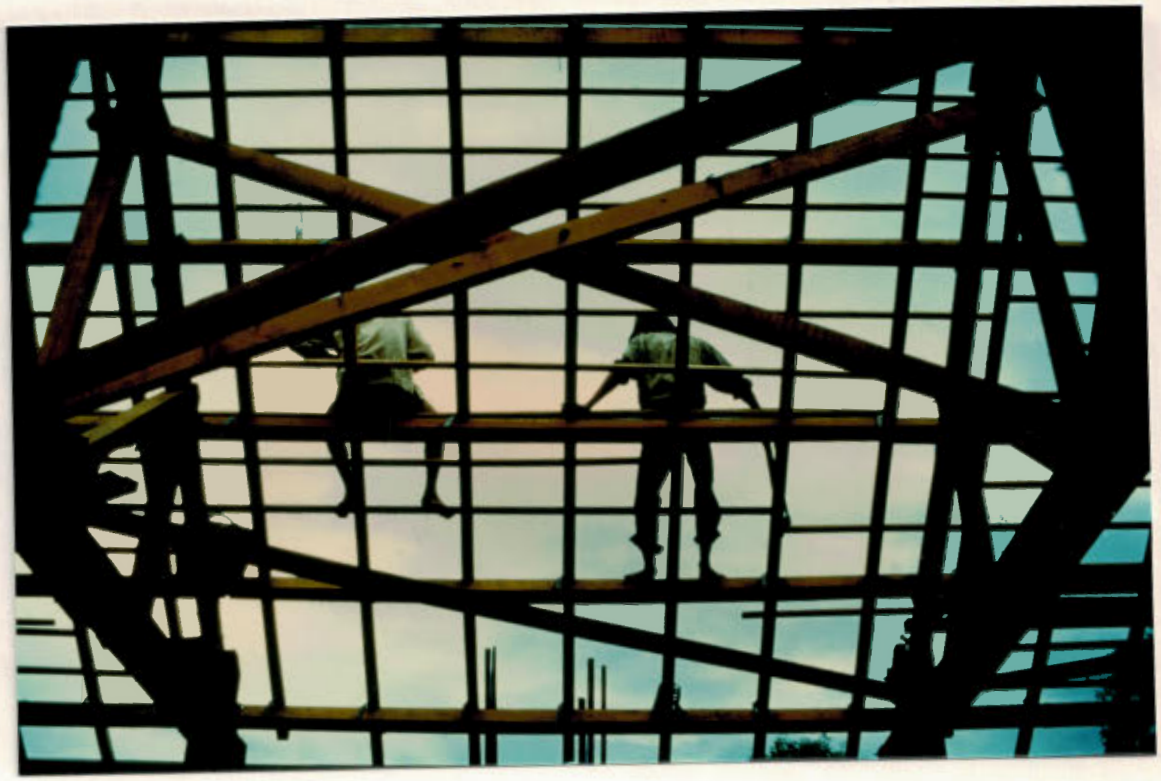
* Numbers of participants and people trained:: Technicians: 42; Builders 36.

The 1st Demonstration building - the Primary School at Loc Dien Village, Phu Loc District. Ribs on the roof hold the tiles down - an old local technique.

Raising the main roof frames and columns

Plastering the torchis walls at Loc Dien - diagonal bracing has been introduced into the structure.

Work on the Loc Dien school roof frame, strenghtened with horizontal and vertical bracing.



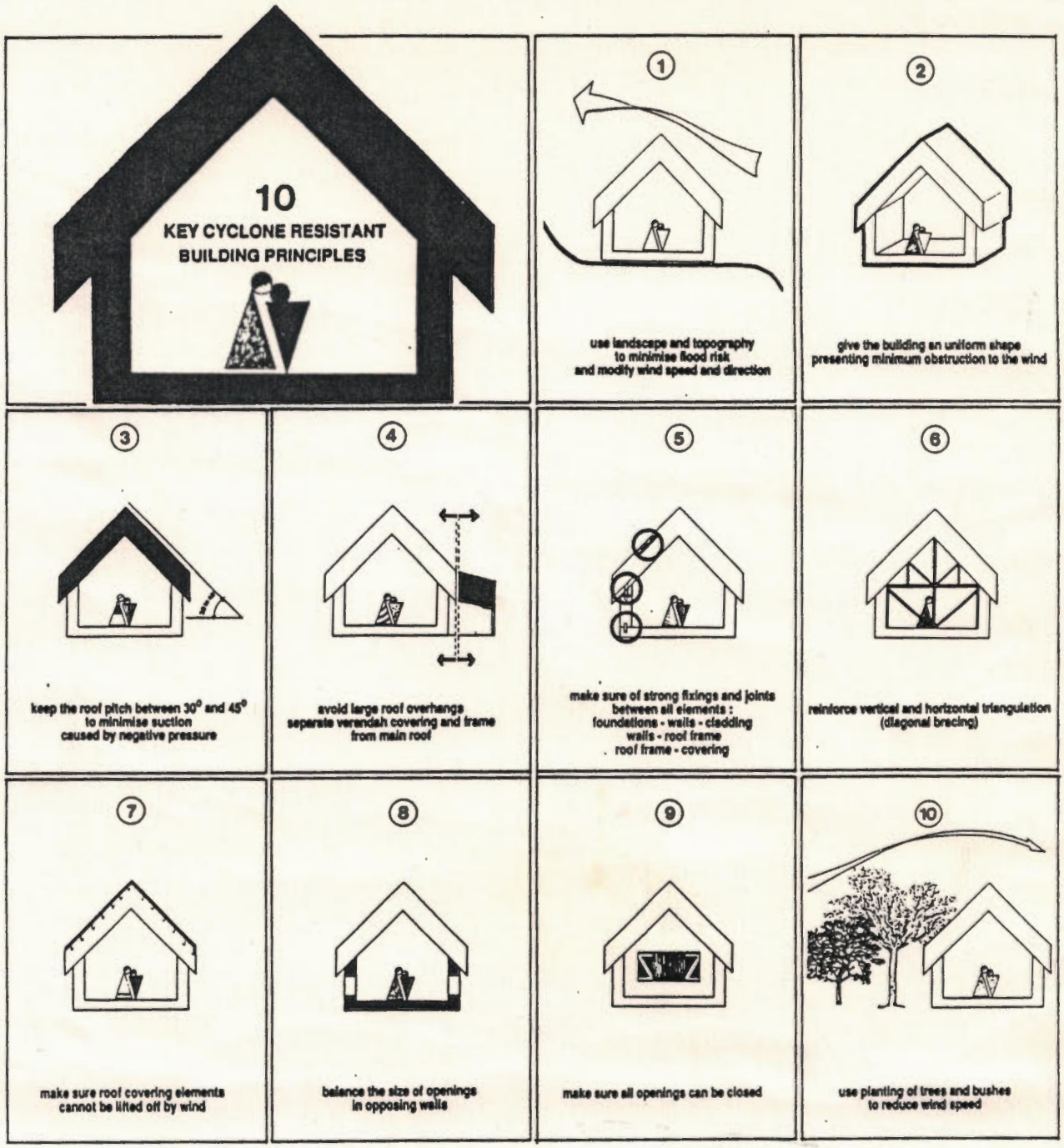
The Health Centre at Hai Lam, Thieu Hay District.

Fixing holes reintroduced into the underside of clay tiles, so that they can be tied down to battens with wires.

Points of Typhoon Resistant Building). The surveys confirmed that one can find ample examples of good typhoon resistant design and construction techniques within existing building practices, on which to base recommendations for each individual province for domestic and small public building.

Box 2.

The 10 key cyclone resistant principles.

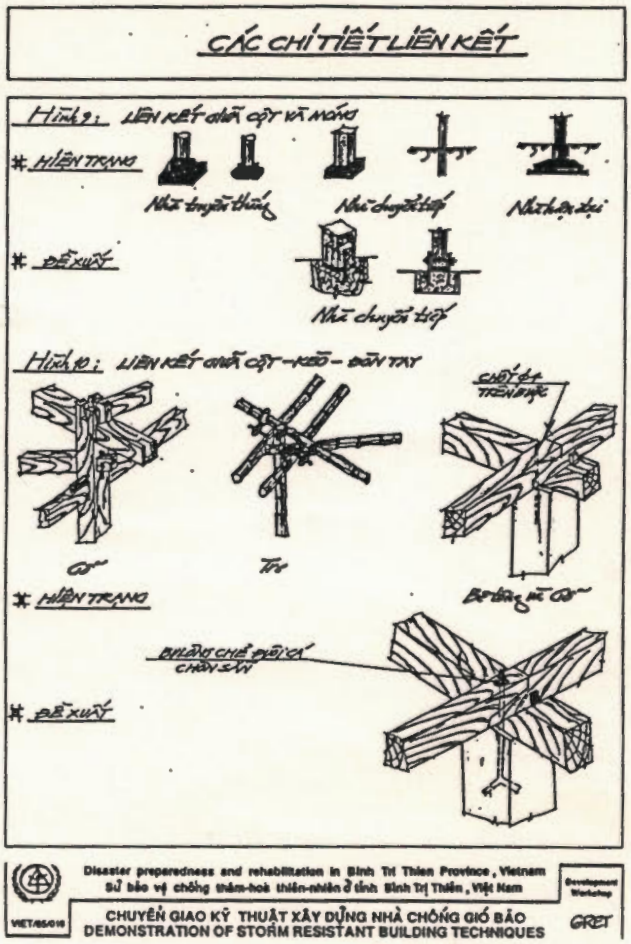


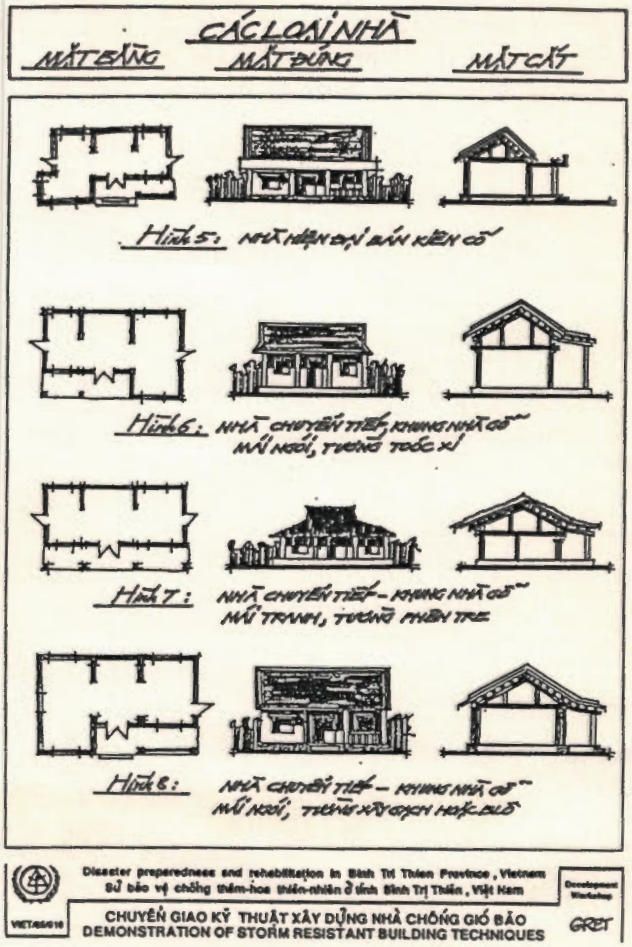
3.4 Technical dossiers

From these surveys in each workshop session for each province the participants produced illustrated dossiers serving as reference guides * for builders, and serving as supporting material to help local technicians in the task of giving technical help to the population and in the task of helping technicians train builders and design buildings. (See Box 3. Extracts from the Phu Loc Dossiers). During the course of the project, IBD drew upon this material to produce generalized handbooks illustrating in more detail the application of the ten key principles of cyclone resistant design, and these were disseminated in the second and third workshops **.

Box 3.

Extracts from the Phu Loc Dossiers





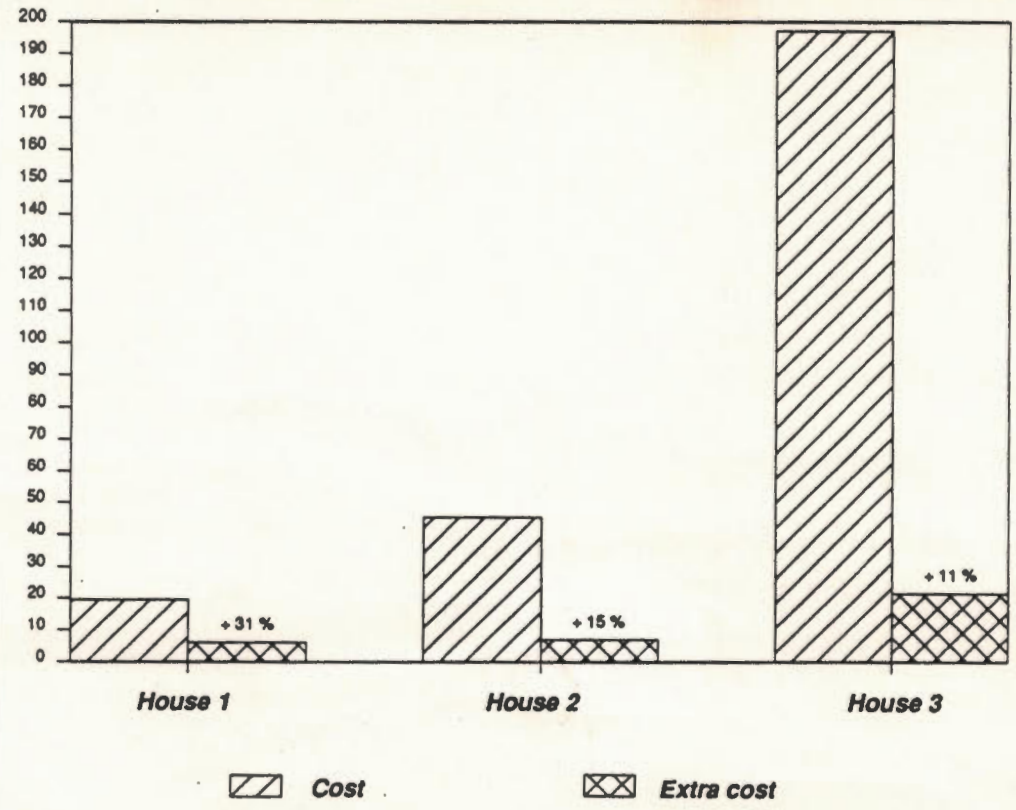
* The participants in the workshops rejected the idea of a technical building manual, on the grounds that it would need to be very varied and complex unless it related to the specifics of a particular district or sub region, and thus difficult to use. They saw the leaflet and the technical dossiers produced in each workshop as more useful, and suited to the local context.

** "Ghiai thich va huong dan 10 xay dung chong bao" ("Manual on the ten key principles of typhoon resistant construction"), IBD with DW/GRET, January 1990.

It should be noted here that once practical work on the sub-contract started, it became clear that technical knowledge about the realities of typhoon resistant building techniques was, at least at provincial level, much lower amongst technicians, with a few exceptions, than had perhaps been perceived at the time of the UNCHS mission, and that what knowledge there was had been highly theoretical, with little application on the ground. One important aspect has been to draw attention to the cost of construction, for the average thatched house, for a transition building, and for local modern construction, and to estimate the extra cost incurred in making each type of building typhoon resistant. (see Box 4. Cost of construction and extra cost for typhoon resistance.) There had been little notion of what it would cost to make buildings safer.

Box 4.

Cost of construction and the extra cost for typhoon resistance. (Cost per 1m^2)



1 Thatched roof, bamboo wattle, timber frame, earth floor, area built = 58 m^2
(family income 40 000 D/month)

2 Tiled roof, timber walls, earth floor, area built = 48 m^2
(family income 60 000 D/month)

3 Tiled roof, cement block walls, cement floor, concrete verandha, area built = 70 m^2
(family income 100 000 D/month)

The diagramme shows the cost for 1 m^2 of construction and the extra cost for 1 m^2 of reinforcement which helps to improve its cyclone resistant ability .

Workshop participants preparing dossiers.

3.5 Communication materials

The sub-project has been increasingly been concerned with the exchange of information between technicians and builders, and the communication of techniques to the people in the province most directly involved with domestic building. Thus the workshop participants have also been guided to examine locally applicable ways to communicate information about typhoon resistant construction techniques, and on this basis they have developed communication materials aimed at the general public, at builders and technicians, and at decision makers in the different provinces concerned: posters, videos for explaining the programme, games, radio announcement texts, and a film '*Our house resists the storm*' filmed in Phu Loc as part of the project, and used to 'advertise' the role of the district technical adviser and the ten key points of typhoon resistant construction. *. For more detail, see Appendix 3. Communication media produced in the Project.

3.6 Public Education campaigns

These materials have then been used in two public education programmes, the first as a trial in Phu Loc District, Thua Thien-Hué province, and the second at provincial level throughout Thua Thien-Hué. They have been dynamic experiences, which have raised the awareness both of the general public, and of decision makers and technicians amongst government departments and institutions.

In Phu Loc the Campaign mobilized local institutions including the People's Committee, the Technical Services, the Red Cross brigades in the schools, and the Disaster Preparedness Committee, and used local services including District mobile videos and the local radio service. The media developed in the 1989 seminars were tried out: the results were encouraging - in two weeks over 5000 people saw the video, numerous posters were distributed and commented on - and the programme participants gained

* For a complete list of materials produced, see Appendix 3.


NHỮNG ĐIỀU CẦN THIẾT KHI
XÂY DỰNG NHÀ CHỐNG
Giò bão
Một là địa thế mọi chiều
Có thông thoáng tới cản nhiều hướng đi
1
2
Điều 2 ta phải khắc ghi
Hình dáng đơn giản mới khi làm
Điều 3 lợp mái góc tà
Ba mươi hay khoảng lân la thôi mà
30°-45°
3
Điều 4 mái rộng nên ngừa
Tránh đưa dài mái chỉ vừa lòi đi
4
Điều 5 liên kết cốt chiều
Neo giữ cho chắc bớt nhiều hiểm nguy.
5
Điều 6 ta nhớ khắc ghi
Thêm thanh chống chéo thêm vì kèo
6
Điều 8 cửa sổ
Kích thước
7
Khi làm ta chớ một yên
Phải thêm điều 7 mới bền mái tôn
Liên kết tấm lợp buộc cẩn
Là điều ta nhớ ghi sâu rõ ràng
8
9
Điều 9 ta phải làm mau
Đóng sao cho kín cửa sau cửa nào
Trồng cây và cả hàng rào
10

Opposite: A poster prepared by the particpants, explaining the ten key points of typhoon resistant construction, with a text in poetry.

On following page: Publicity prepared for the launch of the public education programme in Thua Thien - Hué province , April 1990.

ideas about how to improve the campaign. In the case of the Provincial Public Education Programme, activities have been multiple and rich. In the Hué, the newspapers ran full page articles and press releases prepared by the IBD Core team. The core team toured the province to lecture and discuss, and appeared on local TV with provincial leaders to carry the message further. Provincial and district radio announced the programme and the time of showings for the video (*Our house resists the Storm*), watched each time by several hundreds of people before the showing of main feature films, which are already a regular event. In more localized activities, photo and drawing exhibitions showing activities against natural calamities were organized, and in the schools competitions were held for poetry and drawing about the Campaign for Typhoon Resistance Building; and throughout the province the Women's Union, The Youth Union and the Farmer's Union organized public gatherings on the same theme. All over the province over 2,500 large posters were shown in the main places of gathering, the markets, bus stations and cafés. On the Provincial Day of Disaster Preparedness, the 26th April, the youth brigades paraded in the streets of each District with specially prepared banners, and the Radio and TV ran special programmes. This campaign met with great enthusiasm and several Districts prolonged activities into a second month.

3.7 Implementing a provincial action plan

3.7.1 The action plan

Overall, the framework for these activities in each of the three new provinces has been the application of an Action Plan. The Action Plan (see Box 5. The Action Plan) was defined to create the structure, expertise and supporting material necessary for providing practical assistance in cyclone resistant construction to the people of the region. It has been based on the use of existing local technicians and local builders, the former to train and provide advice, the latter to provide practical advice through their involvement with most building activities on the private and public market. The Action Plan was developed during the first Seminar held for decision makers in Hué in May 1989 and in their subsequent participation with technicians and builders at the end of the Phu Loc Technicians and Builders Workshop in May/June 1989. The programming of activities was influenced by the division of the original province of Binh Tri Thien into three new provinces, thus clarifying the need for the development of an institutional capacity to provide advice about typhoon resistant construction in each province, and the need for workshops in each one.

3.7.2 The 'Cyclone Resistant Construction' unit: a local capacity to operate the programme

The central activity in putting in place the structure of the Action Plan has been the development of a Core team - the 'Cyclone Resistant Construction Unit' within, initially, the Institute of Building Design in Hué, and progressively in other provinces. The role of the core team is to provide in the future the coordination of the provincial programme for typhoon resistant construction, and to assure the design and production of documents and graphic materials needed to do so. They also undertake the training of provincial and district staff, and that of local builders. The core team has an ongoing role of programme evaluation and improvement of products and processes.

The constitution of the IBD core team, all of its members having participated in the Phase 1 workshops and seminars in Hué and Phu Loc, has strongly influenced the ongoing activities of the sub-project: DW and GRET staff felt that it was important that the IBD Core Team, who have played a leading role in the project, go through the experience of running training programmes in the other two provinces, and running the trial Public Education Campaign in Phu Loc, on their own without the presence of foreign experts. To facilitate this, they have benefited from having pre-prepared materials and guidelines for running both activities supplied by DW/GRET. They also had the communication and technical dossiers that the participants themselves had prepared in June 1989 in Phu Loc, and which served as models and materials for the next phase of activities. Therefore, following the Phase 1 workshops in Hué and Phu Loc in May/June 1989, DW/GRET prepared the programme for the Phase 2 Workshops in Quang Tri province, and for the Public Education Campaign in Phu Loc, scheduled for November / December and January respectively.

These materials were delivered by the consultants and discussed with the local team in Hué, who then translated and prepared all the detailed Vietnamese programme materials (individual handouts to participants) and ran the two activities. During the workshop, as in the Phase 1 session, the participants carried out village based enquiries, produced dossiers on techniques and communication methods for the locality, and also designed the second demonstration building - a health centre - which was built in March/April 1990 (with another workshop for builders). The core team produced a report after the Quang Tri workshop in December, which DW/GRET reviewed in January. This provided the basis for revisions, after which the Core Team ran the Third Workshop session in Quang Trach, Quang Binh Province, in February: this time DW/GRET staff were present, and monitored the performance of the team, and the way that the training materials were being used. Some improvements were again necessary, focussing on the need to auto-evaluate the programme and the teaching method in order to see whether the message being communicated was reaching and being understood by the desired target group: participants, and then the general public. Overall, the Core Team have clearly demonstrated their good capability to organize and undertake this type of work.

Similarly, after the Trial Public Education Campaign in January 1990 at Phu Loc, the programme was reviewed by DW/GRET with the Core Team, prior to the preparation of the Provincial Public Education Campaign in April 1990.

The success of the Provincial Public Education Campaign has been indicative of the degree to which the Core Team have become a good operational unit. The almost full time participation of team members during key periods of activity, and always during DW/GRET missions, has greatly facilitated the development of the programme. Nevertheless, in the long run the organization and operation of an advisory service for Typhoon resistant construction requires funding. This has ben difficult for the IBD core team to obtain, since they are in effect competing with other development needs and with other pre and post disaster needs in the provinces. The task has been made harder by the division of Binh Tri Thien into three smaller, and poorer, provinces. Yet when the planning of the Thua Thien-Hué Public Education Campaign was started, the President of the Province, Mr Dien, pledged not only material but also financial support to the campaign, a gesture of support and confidence of considerable significance - at the start of the project such local contribution would have been hard to obtain.

Youth brigades parading in the streets during the public information campaign.

Box 5. THE ACTION PLAN

Background

Developing out of the work of the decision makers seminar and the technicians/builders workshop, an Action Plan was been defined to create the structure, expertise and supporting material necessary for providing practical assistance in cyclone resistant construction to the people of the region. In addition to the contribution from the workshops, the formulation of the Action Plan was been influenced by the sub-division of Binh Tri Thien province into three new smaller provinces, representing the north, centre and south of the old province. The new provinces are Quang Binh (north), Quang Tri (centre) and Thua Thien (south). The strategy of the Action Plan received the approval, at the end of June 1989, of Mr Dien, the then Vice President of Binh Tri Thien Province, and the overall Project Director.

Objective

The central objective of the Action Plan is to provide advice and technical assistance to the people of each province through the services in each District of at least one Adviser for Cyclone Resistant Construction (ACRC), and through the private sector employment of masons and carpenters who are qualified in Cyclone Resistant Construction techniques after completing a training workshop on the subject.

Parallel to putting in place this capacity, coordinated by the Provincial Building Institute, there is a Public Education programme to inform the population about the new services and to raise public awareness about cyclone caused damage to buildings and what can be done.

The training of local masons and carpenters has also contributed directly to improving the quality of public building work on which they are engaged.

Execution and parties involved

The execution of the Action Plan brings together activities at three levels in each province, all aimed at the service of the public.

PROVINCE: Building Institutes: *Cyclone Resistant Construction Unit:*

* Provincial programme coordination & organization
* research
* document production
* training District CRCs & support
* evaluation and improvement

DISTRICT: *District Advisers for Cyclone Resistant Construction (ACRC):*

* training commune level builders
* advice to public in the district
* feed-back to the Building Institutes

COMMUNE: *Local mason and carpenter:*

* practical cyclone resistant building, and at domestic level, house design and material choice advice.

The Action Plan is based on making use, at least in the near future, of people who are already available at each level - the architects and engineers within the institutes in each Province, the technicians already working in the District, in the Office of Construction and Industry, the District Building Company or the Construction Cooperative, the builders who already exist in the districts and communes. In each case training has been needed to give them the right skills and knowledge, and this has been the core activity of the project.

The Public Education programmes have involved additional partners (local TV, the Department of Information and Culture, etc.) better placed to organize a wide-scale communication programme.

4. The achievement of development objectives

4.1 Impact

The impact of the project and the achievement of the development objectives can in the long run only be assessed in terms of less damage occurring in future typhoons. It is premature to make a real assessment of this sort.

Meanwhile, the programme can realistically be seen to have achieved its immediate objectives: a provincial institutional capacity, embodied in the Core Team, has been developed with a working methodology and Action Plan, to enable information to be communicated to local authorities, local builders and the general public about measures that can be taken to reduce the impact of natural disaster on physical structures. At the same time, the feasibility of replication of this approach on a provincial and a national basis has not only been assessed but also tested: the Core team from IBD have run programmes in the Provinces of Quang Binh and Quang Tri, and the overall programme has also been adopted for the Thanh Hoa programme in 1990 (VIE/89/035 Rehabilitation activities in Thanh Hoa Province following typhoon No. 6 Irving - Technicians Workshops) *. There is wider interest at national level to see the spread of such programmes in this decade of Disaster Preparedness.

On the ground, a large number of technicians and builders have been trained, and to date, three demonstration buildings completed ** There is a much greater level of awareness of what can be done amongst the authorities of the three provinces, thanks to the seminars and to the Thua Thien- Hué Public Education Campaign.

In terms of overall impact the project has so far been very positive: the constitution of specially trained teams, a process of training technicians and builders which has been tried and tested, and the development of an excellent local knowledge of 'what is possible'. Linked to the experience of the public information campaigns, this represents a real capacity to identify applicable techniques, evaluate them, and undertake their diffusion. There have also been specific achievements, such as the reintroduction of small holes on the under side of roofing tiles which allow one to tie them down with wire to the battens - this practice had disappeared, and started again with the Hai Lam Health Centre.

Nevertheless, after almost two years of sustained action, the programme (as distinct from the project) must still confront some major issues. It is clear that for the many families who live in the thatch, branch and bamboo structures, there is still very little chance that their home will resist more than a strong storm: a major typhoon will cause damage, loss and the extra cost of strengthening these buildings, small though it is, is still very high to families whose income is negligible. What money there is goes towards more immediate day to day needs. It is realistic on the other hand to envisage the improvement of transition buildings, to resist at least a medium "ten year" typhoon; but still there is insufficient protection against the massive "100" year typhoons, very frequent in recent years along this coast, which destroy essential public infrastructure as much as private homes. The economic situation of the country and the people imposes severe limitations on what can in reality be achieved.

* The VIE/89/035 Than Hoa programme was undertaken by Development Workshop and GRET in collaboration with the Institute of Housing and Public Building Design, Hanoi and the Institute of Building, Thanh Hoa, between November 1989 and April 1990.

** Please refer to the following project dossiers for more details, copies of which have been supplied to UNCHS Habitat:
" Primary School - Loc Dien Village, Phu Loc district - Demonstration building" DW/GRET/IBD June 1990;
" Health Centre at Hai Lam Village - Demonstration building" IBD, April 1990;
" The Library of Quang Trach Lycée No.1, Quang Trach District, Quang Binh province - Demonstration building" IBD, September 1990.

For the individual family, the notion of spending extra scarce resources on protection against a typhoon that may not hit your home remains hard to accept: child vaccination has taken time to become accepted; "vaccinating" your home against typhoon damage has much further to go before the idea of such investment is popularized. There still needs much more promotion and active demonstration in each commune and village of the benefits that such strengthening brings. These remain tasks for the years ahead.

5. Findings and lessons.

A programme of 14 months is too short to be able to have a sustainable impact. In this project, efforts have been made to continue the ongoing contacts between the Vietnamese counterparts and the sub-project contractors. DW and GRET staff have continued to visit the Binh Tri Thien zone, and to have meetings in Hanoi with the local project staff during, to date, the ensuing 9 months after the end of the *sub-contract* period. This has been important. Nevertheless, it remains that, for the long term success resulting from this input there should be a further period of support and action.

In the Action Plan's application, the experience of 1990 has shown the very important role that the *local* institutions for information dissemination, for education, and for political decision have to play in mobilizing resources - of people and money - , and in complimenting the skills of the more centralized institutions. In effect, it is important that the future actions concentrate on mobilizing organizations and people at the village level, which represents the real local social unit, as well as developing the provincial institutional support and organizational capacity.

It is also clear that, if on the one hand the extra cost of strengthening buildings against typhoons is not great, it is still an extra cost, whether public or domestic, which is difficult or even impossible to afford. A programme of demonstration of typhoon resistant building techniques would have much greater impact if it could at the same time address the economic issue of how people can afford to make this short term investment in order to obtain the benefits of having much less to repair or replace after the next typhoon. Lessons could be drawn form the examples of housing loan programmes linked successfully to disaster mitigation, as in Bangladesh. *

The project called for demonstration buildings - new structures which show a variety of techniques, and give opportunities for training. Such buildings can play a significant symbolic role, provided that the purpose of the demonstration remains highly visible: that people can see the techniques - rather than have them covered with plaster - : the demonstration should be an ongoing action.

There is a much greater potential impact to be achieved through demonstrating how to *retrofit* or rehabilitate existing public and domestic buildings so that people can see how their own *existing* buildings can be made stronger. This action is both cheaper and closer to the reality of needs in many villages and communes. The lower cost of working with existing structures offers the opportunity of working in far more villages than is possible with a programme involving three or four new buildings.

The financial implication for the Vietnamese counterparts of operating the programme with, in reality, very scarce resources, has posed a major potential threat to the efficient functioning of the programme. Each government institution has, since 1989, needed to progressively assure its own income and financial autonomy. This means that there are great pressures on an institute to sign contracts which are income generating, and which thus potentially conflict with a UNDP projects.

* The examples of the Grameen Bank and of BRAC in providing housing loan assistance to the very poor amongst the landless rural population of Bangladesh provide models of action directed to resolve specific problems encountered by floods and typhoons. The success of these programmes in impact and repayment has been notable.

6. Recommendations

Terminating programme activities after the VIE/85/019 project input is likely to result in a decreased long term impact and achievement of overall objectives - more dissemination needs to be done, and more consolidation of the Action Plan. There are two principle recommendations to be made:

1. That a follow-on programme is funded.

The methods used in the VIE/85/019 project concentrated on the development of a Core Team in the province, training at district level and the construction of new demonstration buildings. This is a start. Building from this start the recommendation is that there should be a programme concentrating on the retrofitting and reinforcing existing buildings - or even those in the course of construction - in the communes. A new programme would have the following objectives:

* to increase awareness on a massive scale amongst the population of the need to reduce cyclone-damage and the means of doing so;
* to create within the province a widespread and structured network of technicians, administrators and builders who are socially and technically competent to help the local inhabitants to protect their built environment. It would aim to train *all* the builders in typhoon affected communes.
* to bring the practical results of work to date to the largest number of the population through direct demonstration on their own buildings.

To achieve this a programme would undertake the following:

* launch a "Mobile 'Cyclone-Resistance' Unit" with a role providing technical assistance and information, of practically reinforcing existing buildings, and of providing education and training opportunities to the population at commune level (average population 5,000). In, by way of example, Thua Thien-Hué Province, this would involve 4 districts of the province affected by the cyclones (each district has several communes) ;
* run numerous short intensive builders' training workshops;
* demonstrate the cyclone resistant retrofitting of existing buildings, thus showing the technical simplicity and economic viability of methods to strengthen homes and facilities;

2. Housing Loans

That discussions be held to instigate a programme of specific loans for improving housing in typhoon affected zones, and to develop a suitable package.

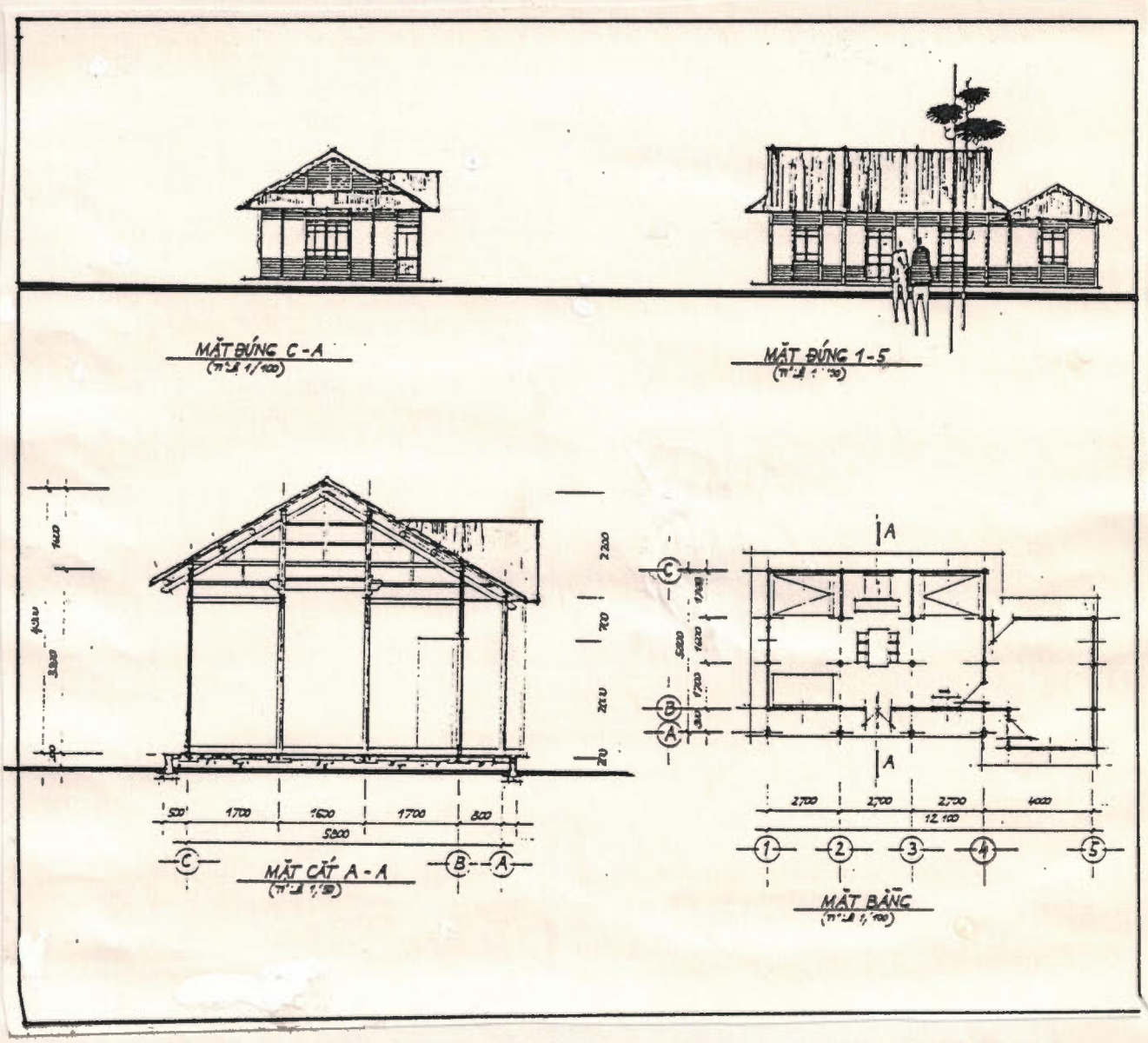
Appendices

Appendix 1. Buildings in Binh Tri Thien Zone, and their resistance to typhoons

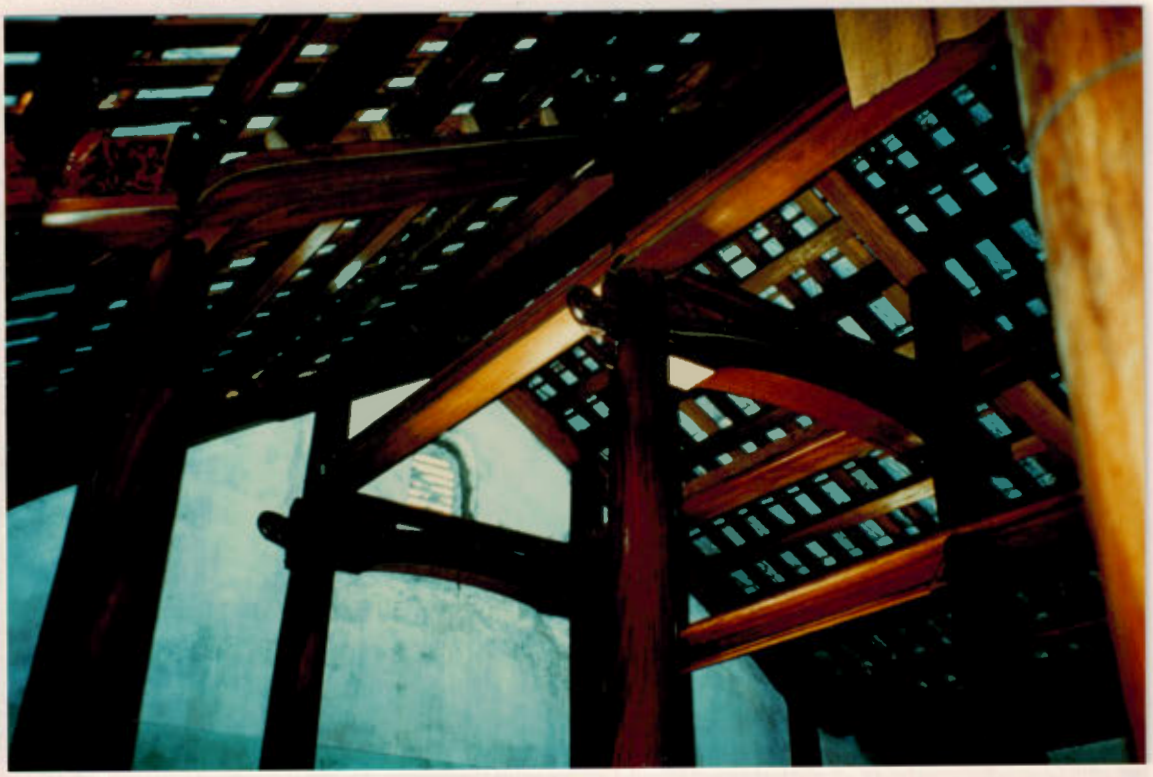
Overview

The majority of buildings in Binh Tri Thien Province are small dwellings with adjoining buildings for kitchens, selling, workshops and animal sheds. Apart from a few contemporary major public buildings (notably in Hué) many of the public buildings use forms and methods similar to those used in the smaller domestic building, and, from the point of view of storm resistance, present similar strengths and weakness. Most buildings, whether modern or old, can be considered primarily in terms of a supporting framework holding up the roof. The walls are in most cases light weight, and often contribute little to the structure. From the viewpoint of typhoon resistance one can identify three main families of construction: the traditional buildings; buildings with a mixture of materials and techniques - the "transition" house evolving towards the "modern" dwelling; and the local public buildings in the districts of each province. The latter two are today jointly characterized by poor detailing and frequent poor quality, and since they increasingly represent the contemporary building stock of the areas, they are a major preoccupation for typhoon resistant construction.

Small traditional house in Binh tri Thien Zone (surveyed by IBD)



Carved wood roof frame.



Traditional house in Phu Loc.

Traditional buildings

Traditional buildings, whether on the scale of the palace and the tombs and temples in the area or that of the house, exhibit quite consistent characteristics: a framed structure formed by many substantial heavy wooden posts and short span beams, the whole held together by finely executed mortise and tenon joints. The roof, often with hipped ends, is an integral part of this vertical and horizontal framing. Between the structural elements the walls are filled in with a variety of materials, ranging from wattle and daub through to fired brick or timber shutters. On older tiled roof buildings it is common to see exposed masonry ribs which help hold down the roof covering.

The combination of good jointing, small structural units and large timber sections give the traditional building structural integrity and stiffness, and these make traditional buildings very able to resist typhoons.

Today increasing scarcity of timber has pushed costs up, making the construction of a traditional house very expensive: nevertheless, one still finds the traditional beautifully executed timber frame used in new houses, where it is regarded as a fine status symbol. Sadly, the quality of wall cladding and roof covering are not always of similar standard, and this is but one example of the second category of houses and public building in the area: the transition building.

Contemporary habitat: the transition building.

Today, a much wider variety of materials and techniques of building are employed than in the past, some of which are the hybrid forms of traditional building, others attempts to apply new techniques or to use new materials such as reinforced concrete, often without the necessary skill to do it well or the money to get things right. Others depend on using locally available grasses and bamboos. The construction of most houses is an ongoing process: with the difficulties of acquiring materials the various parts and elements that make up the building are often linked together in a haphazard manner, more influenced by what is available at the time than by what might best protect and secure the investment that is being made. These buildings are characterized by the weakness of the joints between elements, which thus easily fail; and by the increasing lightness and lack of rigidity in the structure and cladding, offering less resistance to high wind pressures. One sees 10cm thick masonry walls held by lime mortar with nothing to give them stability; or tiled roofs supported on flimsy structures where there is little to inhibit the tiles being blown off the roof. Everyone would like to achieve a local version of the "modern house", epitomized by the use of a reinforced concrete frame and a flat concrete terraced roof: but in the meantime the step by step investment that is made in materials such as tiles, bricks and cement is at high risk form the frequent typhoons. Moreover, the execution of buildings even with good quality materials is becoming so bad that little resis-

Cement block walled house destroyed in small typhoon - a total loss of investment.

Contemporary 'transition' houses, weakened against typhoons by a mixture of materials and techniques

tance is provided against the effect of high winds. This is just as much a problem with small and medium sized public buildings as with domestic "modern" construction.

Public buildings

Public buildings, although designed by technicians, are just as much at risk to storms. The weakness in detailing and execution are compounded by the design of the buildings: a trend towards high unframed structures, the use of gable end walls with little rigidity, large verandahs where the roof is greatly exposed to uplift. In effect of Typhoon Irving in 1989 typified this problem, with the major collapse of hospitals and schools in the Thanh Hoa province.

Costs

Although little able to resist the effect of cyclones, this does not mean that construction is cheap. At 1989 prices, a thatch and bamboo frame structure cost 50,000 Dong/m2; a bricks and tile roof structure 200,000 Dong/m2, and a reinforced concrete structure with a concrete flat roof some 300,000 Dong/m2. Put these prices against the monthly wage of a local engineer, in the order of 45,000 Dong/month, and one has an idea of the magnitude of the investment. The affordability of housing appears even worse for village farmers and fishermen. When one considers that this investment is scarcely protected against the damage caused by a typhoon, it is easier to understand the impact of the cost of recovery after a typhoon to families and the state alike; and to understand the necessity of investing a bit more to make buildings and materials more secure.

Typhoon damage and cost: prevention or recovery?

Typhoons of varying intensity hit the Vietnam coast: those with small intensity which come every year, where damage should be small; medium "10 year" typhoons causing far more major damage, and to which the lighter buildings, notably those of thatch and bamboo walls, resist badly - more solid buildings should resist but invariably do not; and massive "100 year" typhoons which cause major devastation. The effect of typhoon winds for all but the frailest structures is progressive: in a medium typhoon bamboo and

thatch shelters frequently collapse rapidly under the initial buffeting of the wind. Damage to more substantial buildings comes in a sequences of events, where elements are weakened or loosened by pressure and suction: the tiles begin to lift on the eaves and ridges, the complete roof blows away, followed by the roof frame collapse. Walls are either flattened or carried off, depending on the structure. Rapidly, 70 or 80% of the building can be raised to the ground or blown away; 40 to 50% of the materials lost beyond recovery.

Against this cost and loss, comprehensive surveys carried out by Binh Tri Thien programme participants during 1989 and '90 have shown that an extra construction investment of 10% (on more solid buildings) to 30% (on thatch and bamboo shelters) would make most buildings able to resist small and medium scale typhoons, the latter seeming to occur more frequently than every ten years. It has thus been a major task of the Binh Tri Thien programme to persuade people to spend time and money on preventive action in order to secure their investment.

Who builds and how?

Houses in the Binh Tri Thien zone are built for the most part by local semi skilled builders, employed in some capacity even in the simplest construction. The family invariably helps with the work too. Local materials are used for the most part. Little or no attention to typhoon resistant construction details, and there are no regulations. When a typhoon arrives, last minute measures are taken to stop the tiles blowing off, or the walls collapsing: and by this time it is often too late.Public buildings, designed by local technicians at provincial and district level who carefully follow the rules for reinforced concrete design, have had habitually little attention paid to typhoon resistant detailing and form. The local building brigades and contractors who do the construction have often little contact with the designer, and pay even less attention to quality control: this sad state of affairs has become too often the accepted norm.

After a typhoon, the population and the province mobilizes in a major effort to reconstruct, but the quality of work that contributed to the collapse of the building beforehand is repeated: at the next typhoon the building will be just as much at risk. Thus the cost of recovery is compounded by its repetitive nature.

Weak public buildings - a hospital in Thanh Hoa with no roof after a typhoon in 1989.

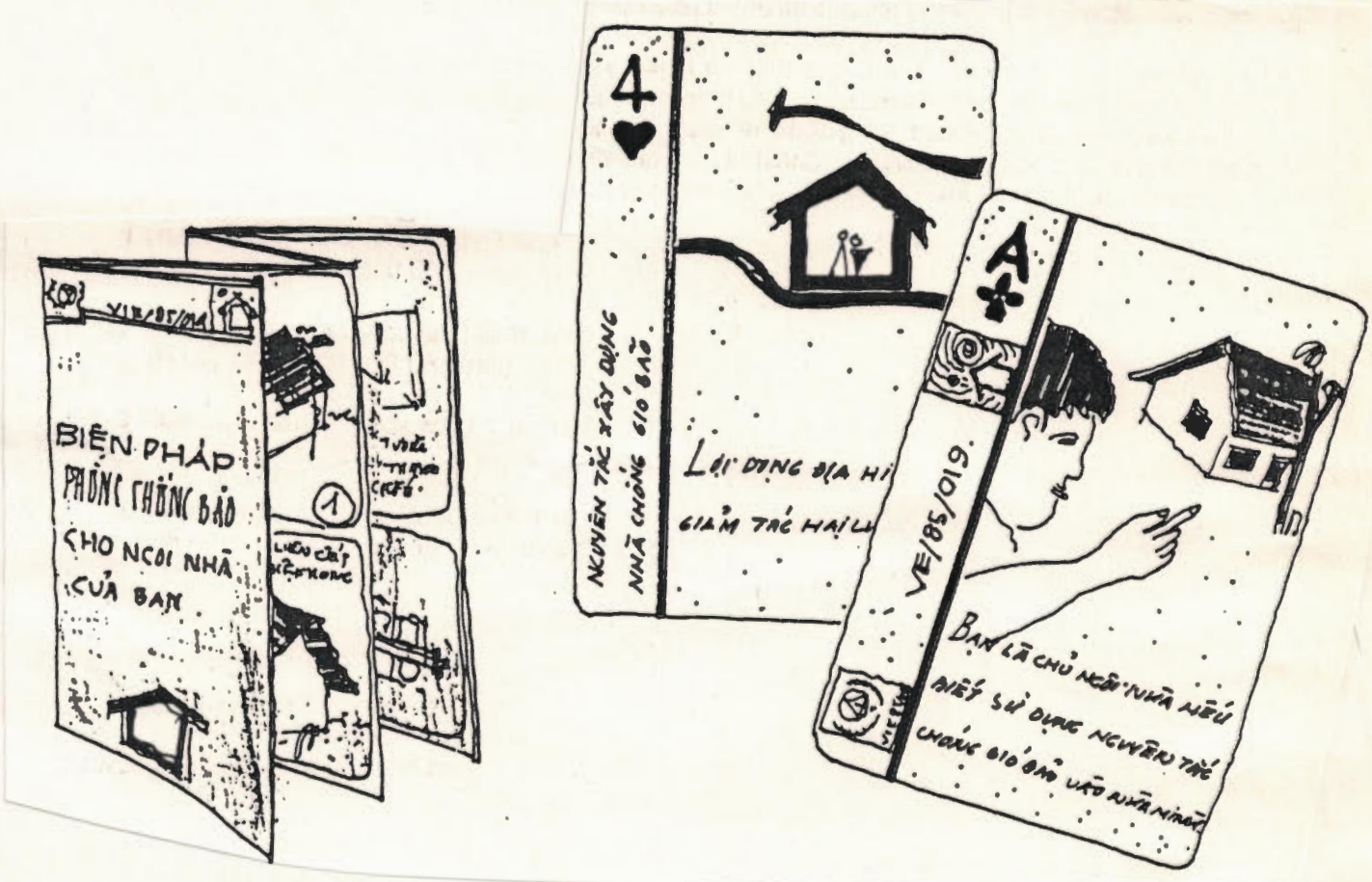
Appendix 2. Summary of achieved outputs.

The outputs called for in the ToR:	The outputs achieved in the project:
1. Training workshops for builders on how to build more disaster resistant houses and small buildings.	1. Three training workshops for builders; three training workshops for technicians; three seminars for decision makers.
2. Demonstration prototypes, as part of the workshops, and to meet regular government building needs.	2. Three demonstration public buildings completed by September 1990, and a fourth building being programmed for construction in Hué in 1990/1991.
3. Illustrated building manuals for the use of local builders.	3. Technical dossiers produced for each of three provinces; posters (10,000) and leaflets and folders showing the 10 key points of typhoon resistant construction; a brochure "Housing and cyclones" 2 volumes (see interim workshop dossier); Dossier on basic information on cyclone resistant construction (DW/GRET).
4. Better trained local builders in typhoon resistant building techniques.	4. More than 36 builders directly involved in workshops; entire teams of builders involved in the construction of the second and third demonstration buildings. In addition, 42 technicians trained directly, and a large number of 'decision makers' informed.
5. Awareness of other government institutions and departments on housing disaster preparedness, including diversified graphic materials to be utilized in various public education programmes.	5. One trial public education programme carried out in Phu Loc District; a Provincial Public Education Programme carried out in Thua Thien-Hué in April 1990. Seminars linked to these programmes involving large numbers of government institutions and organizations. Supporting graphic materials including posters and videos produced.
6. Provincial and national action plans for the establishment of a permanent capacity to implement a housing and small building vulnerability reduction programme.	6. Definition of an Action Plan for each province, and implementation of the Action Plan in four provinces: Thua Thien-Hué; Quang Tri; Quang Binh; and Thanh Hoa. A strong institutional capacity developed in Hué (IBD), and an improved capacity in Hanoi (IHPBD).

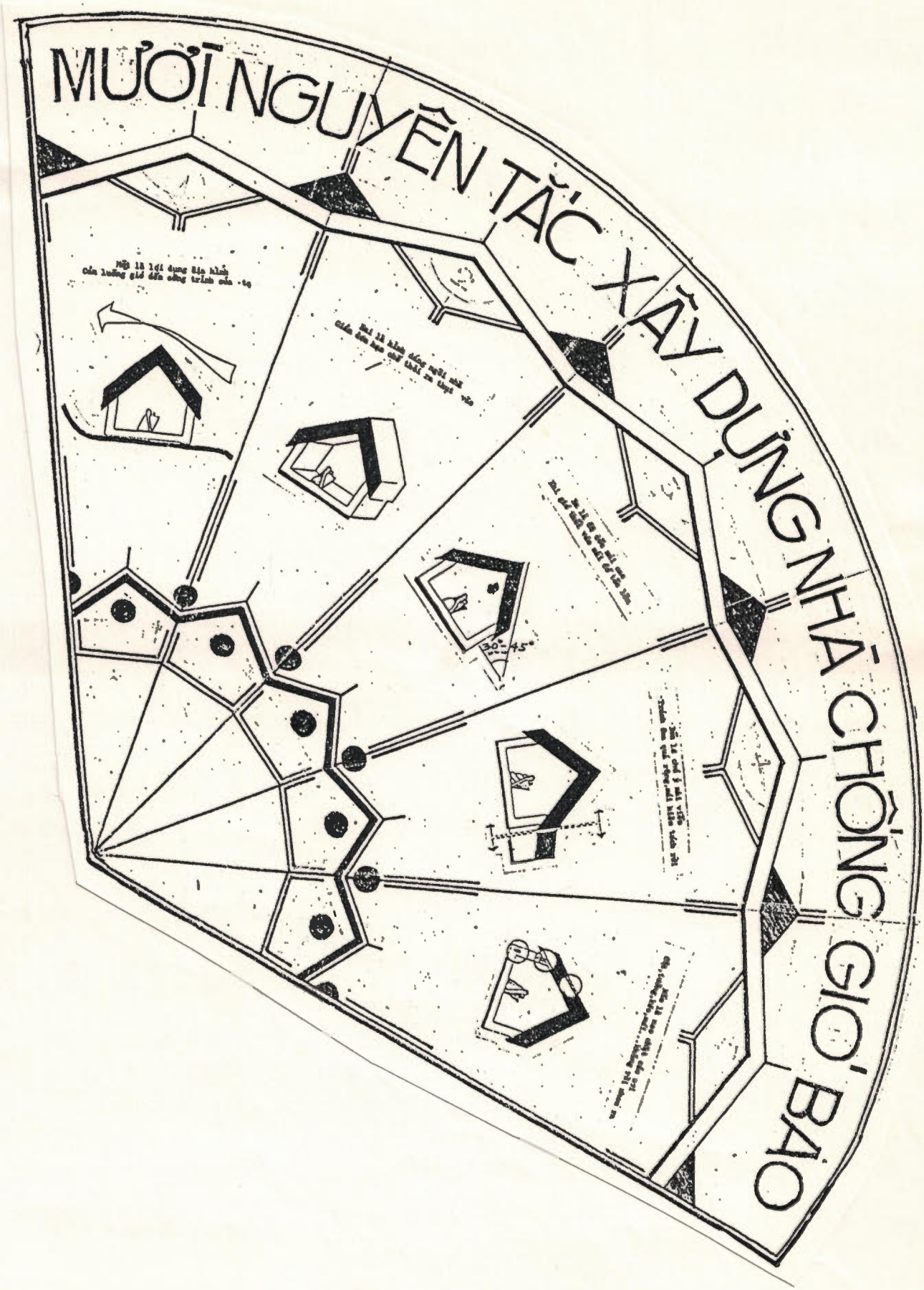
Appendix 3. Communication media produced in the Project.

The following materials were produced by the participants for communicating information to the various target groups of the programme (see Appendix 4 for exact titles):

* Full colour posters illustrating the ten key points of typhoon resistant design.
* The video "Our house resists the storm".
* Loudspeaker and radio announcement texts - on typhoon resistance, and on times of showing the video. Megaphone announcements for publicizing the video, used in the districts.
* Television presentations in Hué.
* A folded leaflet showing the ten key points of typhoon resistant building.
* A manual for technicians showing the ten key points of typhoon resistant building.
* Technical dossiers for each of the three provinces on local techniques to be encouraged to achieve typhoon resistant buildings.
* A dice game based on the traditional horse racing game played with a board illustrated with the ten key points.
* A pack of cards also illustrating the ten key points.
* The design for a fan showing the ten key points of typhoon resistant design.
* Five poems about typhoon resistant design.
* Three demonstration buildings.
* An exhibition in Hué mounted during the Public Information Campaign in April 1990 by the core team at IBD..



Design for a fan.



Appendix 4. Documents produced in the project by DW/GRET and IBD.

Project Proposal:

"Disaster preparedness and Rehabilitation in Binh Tri Thien Province (VIE/85/019), Sub-Project No.3 : Demonstration of storm-resistant building techniques. Technical proposal" Development Workshop/GRET, August 1988.

Inception report:

J. Norton: "*Inception report and report on the formulation of the workshop*", Development Workshop/GRET, February 1989, 26 pages + appendices.(UNCHS)

Documentation for the 1st Workshop Sessions:

- "*Session 1. 22 May - 17 June 1989, Hué*" **Development Workshop/GRET, April 1989, Programme Leaflet. 4 pages, (UNCHS)**
- "*Indigenous building in Central Vietnam*", **Development Workshop/GRET, April 1989, 44 pages. (UNCHS)**
- "*Demonstration Building: Primary school, Loc Dien, Phu Loc District*", **Development Workshop/GRET, April 1989, 20 pages. (UNCHS)**
- "*Cyclone Resistant Construction - basic information*", **Development Workshop/GRET, April 1989, 81 pages. (UNCHS)**
- "*Cyclone Resistant Construction - manuals*", **Development Workshop/GRET, April 1989, 42 pages.(UNCHS)**
- "*10 key cyclone resistant building principles*", **Development Workshop/GRET, April 1989, 10 pages. (UNCHS)**
- **Dossier of the IHPBD exhibition** "*Cyclone resistant construction*" **IHPBD, Hanoi, 1987, 53 pages.**
- "*Demonstration Building: Primary school, Loc Dien, Phu Loc District*", **Development Workshop/GRET, April 1989, 10 page leaflet. (UNCHS)**

Documentation produced during or following the 1st Workshop Sessions:

- "*Loc Dien Primary School*" **Development Workshop/GRET/IBID/IHPBD, June 1989, 16 pages. (UNCHS)**
- "*Action Plan*" **Development Workshop/GRET/IBID/IHPBD, June 1989, 9 pages. English and Vietnamese. (UNCHS)**

Participants in workshops - "*Session 1 workshops - Results of working groups*" **Development Workshop/GRET/IBID/IHPBD, June 1989, 16 pages. English and Vietnamese. (UNCHS)**

Participants in workshops - Leaflet : "*10 key cyclone resistant building principles*", **IBD/DW/GRET, June 1989 (Vietnamese)**

Participants in workshops - Poster: "*10 key cyclone resistant building principles*", **IBD/DW/GRET, June 1989 (Vietnamese)**

J. Norton; G. Chantry: "*Session 1 workshops - Overall presentation*" **Development Workshop/GRET, June 1989, 30 pages. (UNCHS)**

Documentation for the Interim Workshop:

- "*Programme of support and advice to the population - first field test in Phu Loc, Thua Thien Province, Nov 89: Programme Presentation*" **Development Workshop/GRET, September 1989, 5 pages. (UNCHS)**
- "*Interim Workshop, Quang Tri Province, November 1989: Programme Presentation*" **Development Workshop/GRET, September 1989, 8 pages. (UNCHS)**
- "*Video Support to Workshops; Comments (English - Vietnamese)*" **Development Workshop/GRET, October 1989, 8 pages (UNCHS)**
- "*10 key cyclone resistant building principles*" **Vietnamese version, 4 page leaflet, Development Workshop/GRET, October 1989 (UNCHS)**
- "*10 key cyclone resistant building principles*", **Poster, IBD/DW/GRET, June 1989 (Vietnamese)**

Documentation produced during or following the Interim Workshop:

- "*Interim Workshop Quang Tri Province, Dec. 1989.*" **Programme presentation, IBD, December 1989**
- "*Session II Workshops, Overall Presentation*" **IBD, January 1990, English and Vietnamese Version**
- **Design Dossier for Second Demonstration Building:** "*Hai Lam Health Centre*" **IBD, December 1989**

J. Norton, G. Chantry "*Interim Workshop, Overall Presentation*" **Development Workshop/GRET, January 1990, 5 pages (UNCHS)**

G. Chantry "*Missions appui au Projet*" **Development Workshop/GRET, January 1990, 26 pages, (UNCHS)**

"*Health centre at Hai Lam Village - Demonstration Building*" **IBD, April 1990, English and Vietnamese.**

Documentation produced during or following the Third Workshop:

"*Technicians Workshop Quang Trach District, Quang Binh Province: Results of* **Working Groups" IBD & Participants, March 1990, 102 pages. Vietnamese, and English summary.**

"*Thu Vien Truong Pho Thong Trung Hoc So 1*" "*The library of Quang Trach Lycée No.1 - design dossier*" **IBD & DW/GRET, 50 pages, Vietnamese with English summary.**

"*The library of Quang Trach Lycée No. 1, Quang Trach District, Quang Binh Province - demonstration building, presentation dossier*" **IBD, 23 pages, Vietnamese and English.**

Documents produced for the Provincial Public Education Campaign:

"*Chien Dich Tuyen Truyen O tinh Thua Thien-Hué, 4/90*" ("*Provincial Public Education Campaign, Thua Thien-Hué province, April 1990*"). **IBD, Vietnamese dossier; English presentation.**

Other relevant documents:

"*Ghial thich va huong dan 10 xay dung chong bao*" ("*Manual on the ten key principles of typhoon resistant construction*"), **IBD with DW/GRET, January 1990.**

"*Report: the study tour on cyclone prevention in the Philippines*" **IBD, November 1990.**

Video:

"*Our house withstands the storm*" **(formerly titled "***My husband builds our house***") Development Workshop/GRET; IBID/IHPBD/Hué TV, June 1989, 17' (UNCHS)**

"*Video Support to Workshops; Comments (English - Vietnamese)*" **Development Workshop/GRET, October 1989, Video film VHS-PAL, with comments (UNCHS)**