Each year typhoons sweep across the central and northern coastal plains of Vietnam, leaving a trail of death, destruction and loss of crops. In the aftermath, the population mobilizes to rehabilitate their region. Scarce resources of materials and money are consumed. Much damage could be reduced, and far less effort, materials and money consumed, if preventive steps were taken to make buildings stronger against typhoons.

This article describes a programme started in January 1989 in the provinces of Quang Binh, Quang Tri and Thua Thien (BTT zone), aimed at reducing typhoon damage by raising awareness about the need to protect buildings and about techniques to achieve this. The BTT programme was initiated on request from the Vietnam Government by UNCHS/Habitat, and designed and implemented by Development Workshop (DW), Group de Recherche et d’Echanges Technologiques (GRET), the Institute of Building Design (IBD) in Hue and the Institute of Housing and Public Building Design (IHPBD) in Hanoi.

Most buildings in BTT zone are small dwellings with adjoining structures for kitchens, selling, workshops and animal sheds. Public buildings — with the exception of a few major ones — use forms and methods similar to those used in the smaller domestic building, and, for storm resistance, present similar strengths and weaknesses. Most buildings can be considered primarily in terms of a supporting framework holding up the roof. The walls are usually light-weight, often contributing little to the structure. 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 both characterized by poor detailing and poor quality; since they increasingly represent the building stock of the area, they are the major concern for typhoon resistant construction.

Traditional buildings — whether on the scale of the region’s palaces, tombs and temples, or that of the house — exhibit quite consistent characteristics: a framed structure with many substantial heavy wooden posts and short span beams, held together by finely-executed mortise and tenon joints. The roof, often with hipped ends, is an integral part of this framing. Between the structural elements, the infill walls use various materials, from wattle and daub to fired brick or timber. On tiled roofs it is common to see exposed masonry ribs which help hold down the covering.

1. Opposite: Bao! Cyclone! Launching the public information campaign in Thua Thien Province, the IBD core team prepared a special poster.

2. Solid and smoothly shaped traditional housing resists against typhoons.
The combination of good jointing, small structural units and large timbers gives traditional buildings structural integrity and stiffness: these make them very able to resist typhoons.

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

Contemporary habitat: the ‘transition’ building

A wider variety of materials and techniques are employed today than in the past; some are hybrid forms of traditional building; others are the result of attempts to apply new techniques and new materials such as reinforced concrete; often without the necessary skill or the money to get it right. The poor depend on using straw, leaves, branches and bamboos. Construction of most houses is a protracted process; with the difficulties of acquiring materials, various elements that make up the building are often linked together in a haphazard manner, influenced more 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, offering less resistance to high wind pressures. Everyone would like a version of the ‘modern house’, which, once complete, offers quite good typhoon-resistance: but in the meantime the step-by-step investment made in materials such as tiles, bricks and cement is at high risk from frequent typhoons. This is exacerbated by poor workmanship.

Public buildings

Public buildings, although designed by technicians, are similarly vulnerable to storms. The same weaknesses in detailing and execution are compounded by the design of the buildings: a trend towards high un-triangulated structures, the use of gable end walls with little rigidity and large verandahs where the roof is greatly exposed to uplift. Typhoon Irving in 1989 highlighted this problem, with the collapse of hospitals and schools in the Thanh Hoa province.

Costs

Construction is not cheap. At 1989 prices, a thatch and bamboo frame structure cost 50,000 Dong per square metre; a brick and tile roof structure 200,000 Dong per square metre, and a reinforced concrete structure with concrete roof some 300,000 Dong per square metre. Comparing this to the monthly wage of local engineers – in the order of 45,000 Dong per month – gives an idea of the magnitude of the investment. The affordability of housing is a worse problem for farmers and fishermen, with an average family revenue of 40,000 Dong and often less.

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 limited; medium, so-called ‘ten year typhoons’ causing far more major...
Những điều cần thiết khi xây dựng nhà chống giọt bão

1. Mô tả địa hình môi trường
   - Không thiếu chỗ can nhiều hưởng đi

2. Điều 2 ta phải khắc kích hình dạng địa điểm jan một khi làm nhà

3. Điều 3 lớp mái kết cấu
   - Ба mùa hay khó khăn là nước

4. Điều 4 mái rộng nên mưa
   - Tránh dầu ở mái, chỉ xung lôi đi

5. Điều 5 liên kết cấu chiều
   - Nếu giữ chỗ chắc bôi nhiều hình nắp.

6. Điều 6 ta như khác nhỉ
   - Thêm thành chống che thêm vòi xô

7. Điều 7 là che
   - Phục thêm điều 7 mới lớn trò

8. Điều 8 cụ sọ doctrine
   - Kích thước điều thêm mess đong nhẹ nhõm

9. Điều 9 ta phải làm mâu
   - Đừng sáo chết kim chỉ sau cái.

10. Điều 10 ta phải làm mâu
    - Đừng sáo chết kim chỉ sau cái.
8. Loc Dien primary school – the first demonstration building. Programme participants raising the main roof frames and columns.

Against this cost and loss, comprehensive surveys carried out by BTT programme participants during 1989 and 1990 show that an extra construction investment of ten per cent (on more solid buildings) to 30 per cent (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 BTT programme to persuade people to spend time and money on preventive action in order to secure their investment in the ‘transition’ building.

Who builds and how?
Homes in the BTT zone are usually built by local builders, employed somehow even in the simplest construction. The family helps with the work. Local materials are used for the most part. Usually little or no attention is paid 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. By this time it is often too late.

Public buildings, designed by provincial and district technicians who carefully follow rules for reinforced concrete design, have habitually had little attention paid to typhoon resistant detailing and form. The local building brigades and contractors who do the construction have little contact with the designer, and pay even less attention to quality control. This sad state of affairs has too often become 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 now 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.

A programme to create a local capacity
The UN-funded BTT programme followed the massive 1985 typhoons which devastated BTT zone, leaving 875 people dead, 49,000 houses destroyed and 230,000 damaged, 2,600 classrooms destroyed, and six hospitals and 250 health centres damaged.

Implemented by sub-contractors Development Workshop/GRET, the programme’s objectives were clear from the outset:

- Rather than develop regulations which would impossible to apply, the programme should instill, through training, a local capacity to raise awareness about the need for preventive action against typhoon damage to buildings, and develop a local capacity to show people what can be done to make homes and public buildings stronger.

- The programme should put in place a plan of action at provincial, district and commune level to guide people in how reduce the effect of typhoons on buildings;

- The programme should support these activities by helping the organization of the local services who would in future maintain the plan of action.

In implementing these objectives, one of DW/GRET’s local partners, the IBD Huế, has, increasingly, taken a leading role in maintaining the programme.
How to achieve a local capacity

The programme focussed on three levels of activity:

- short (one and two-day) seminars, to raise the awareness of possible actions for typhoon resistant building amongst decision makers and 'politicians' (essential for the long-term continuation of the programme);
- two to three-week training programmes for technicians and builders from the provincial towns, the districts and communes;
- district and province-wide public information programmes to carry the message of the programme to the population.

Developing the organizational as well as the technical skills of the technicians and builders in each province has formed the backbone of the programme. Each provincial seminar has involved the participants in theoretical and practical work: conducting village level surveys to find out the weak points of local construction, how local buildings can be made to resist typhoons, and with which locally available resources; exploring ways in which this information can be transferred to the population; and detailing the extra costs involved. The participants produced technical dossiers for each aspect, and used the media they felt was best suited to inform the public: posters, poetry, radio and video materials, including a short film.4

Central to the programme has been the proposal by DW/GRET, (and the subsequent refinement by the participants) of 'ten key principles of typhoon resistant construction': principles which can be adapted to suit local realities rather than those which cannot be applied by the population: use topography to shelter your building; keep the building form simple, with minimum obstruction to the wind; pitch the roof between 30° and 45° to lower wind suction; avoid large overhangs, and separate the verandah from the house; tie the whole structure firmly together; use diagonal bracing; fix down the roof covering; balance the size of openings; if you can, make sure that all openings can be closed; plant wind breaks.

During each seminar, the participants also designed, and subsequently constructed, a public building. These buildings - a primary school, a health centre and a library - have provided the opportunity to demonstrate the application of the 'ten key principles'. They have given first hand experience to local builders and technicians, particularly with respect to quality control on the building site. These demonstration buildings have played an important role in making the public aware of the programme and its message.

In the course of the seminars, IBD Huế staff have been trained to take over from DW/GRET the role of organization and training, and out of this IBD, Huế has constituted a core Typhoon Resistant Construction Unit: the 'IBID Core Team'.

How to get the message to the public?

The most fundamental action in the programme has been to inform the population about the need to protect their buildings, about the ways that this can be done, and who can help them – the builders and technicians trained in the programme. Following an encouraging trial campaign in January 1990, a major campaign was launched in Thua Thien Province in April 1990, reaching some 500,000 people in communes affected by typhoons. The campaign activities have been multiple and rich. In Huế, newspapers ran full page articles prepared by the IBID Core Team. The team toured the province to lecture, and appeared on local TV with provincial leaders to carry the message further. Local radio announced the programme and the times of showings for the video, which was seen by several hundreds of people prior to main feature films. Locally, photography and drawing exhibitions...
showing action against natural calamities were organized, and in the schools competitions were held for poetry and drawing about the Campaign for Typhoon Resistance Building. Throughout the province, the Women’s Union, the Youth Union and the Farmer’s Union organized public gatherings on the same theme. Over 2,500 large posters were shown in gathering places, markets, bus stations and cafés all over the province. On the Provincial Day of Disaster Preparedness, 26th April, youth brigades paraded the streets of each district with specially prepared banners, and radio and TV stations ran special programmes. This campaign met with great enthusiasm and several districts prolonged activities into a second month.

A plan of action in place
Developing from the seminars, and embodied in the first public information campaigns, was a plan to ensure the spread and application of typhoon resistant building techniques, first in the provinces of the programme, and gradually to other provinces, ultimately becoming a national programme. Its execution brings together three levels of action. At province level, the Building Institutes constitute the Typhoon Resistant Construction Unit. The Unit organizes the programme, prepares training and information materials, trains district technicians, and constantly evaluates and improves the programme. At district level, local technicians now trained in typhoon resistant construction techniques, become the local public advisers, helping families and training local builders. They also advise on how the core teams should improve the programme. At the commune level, the local mason and carpenter, once trained, through involvement in domestic building activities provides practical advice in house design and materials.

In the plan’s application, the experience of 1990 has also shown the important role to be played by local institutions in information dissemination, education, and political decision: mobilizing resources – of people and money – and complementing the skills of the core teams.

The impact of the BTT programme is, so far, 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
11. Work on the roof frame, strengthened by horizontal and vertical timber bracing.

12. Metal straps link the roof elements: great attention has been paid to improving the small details that tie whole buildings together.

13. The public information campaigns: villagers reading posters and poetry sheets about the ten key points of typhoon resistant building techniques.

14. Villagers gather with interest round the 'ten key principles' poster.

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 against disease is becoming accepted; 'vaccinating' your home against typhoon damage still needs much promotion and active demonstration of the benefits it brings. These remain the tasks for the years ahead.

Notes
1. Until July 1989, these three provinces were known as Binh Tri Thien Province. Quang Binh has a population of 646,000; Quang Tri 458,000; and Thua Thien 891,000 (1989 figures).
2. Thanh Hoa province, just to the north of the BTT provinces, was hit by a major typhoon in October 1989. DW & GRET were called in to provide rehabilitation assistance, and at their instigation involved the Vietnamese institutes of IBD Hue and IHPBD Hanoi.
4. *We Build our New House* - a story about a young family who follow the advice of properly trained local builders and technicians: their new home resists when the typhoon arrives.

JOHN NORTON IS A DIRECTOR OF DEVELOPMENT WORKSHOP (EUROPE OFFICE: BP13, 82110 LAUZERTE, FRANCE); NGUYEN SI VIEN IS DIRECTOR OF THE IBD DESIGN, 24B LYTHUONG KIET, HUE CITY, THUA THIE-HUE PROVINCE, VIETNAM; GUILLAUME CHANTREY IS A MEMBER OF THE HABITAT CO-ORDINATION TEAM, GRET, 213 RUE LA FAYETTE, 75010 PARIS, FRANCE.