

would take two to four years for damaged trees to resume normal patterns of fruit production.

There was also a knock-on effect involving unemployment among workers in food processing and packing plants.

Support for *tree crop cultivators* varied according to the crop type and the size of the producer. Farmers needed short term cash reserves to repair housing damage and to buy food, and many sought credit from commercial or informal sources. The overall government rehabilitation policy involved using grants to encourage the clearance of land and provision of planting materials for short-term crops. This was intended to generate some income while trees recovered. There was also to be a programme of distribution of seedlings for fruit trees and other tree crops for recovery in the medium and long-term. The rehabilitation programme experienced problems in the supply of planting material. There were also some irregularities in the registration arrangements, with an up-front payment sometimes being demanded. For larger producers, supplying major processing companies, there was credit and supplies of planting materials. These arrangements generally favoured only the more wealthy farmers.

Field crop farmers received little assistance, although it was never very clear why this was so. The main source of damage was the beating effect of heavy rain (which particularly damaged vegetable crops) and the effects of waterlogging which persisted for several days.

Most *livestock farmers* kept small livestock. Support was patchy. The Agriculture department attempted to provide replacement animals either free, or at subsidised prices. Again this programme involved a number of local irregularities. There were also delays of up to three months before assessments were carried out. Only about 20% of this group received any help.

Smaller *merchants and traders* suffered badly. Most lost almost all of their stock, and few had insurance cover. The majority needed loans to restore stocks. The import of free relief goods into the area hit sales badly from the start. And later on, sales continued to decline because of the widespread reduction in income. Larger employers found that requests for credit from their employees was a drain on cash reserves, and were forced to seek additional commercial bank loans.

Wage labourers received virtually no assistance of any kind. There was a general shift from agriculture to construction labour. But most government and donor-funded reconstruction projects gave no preference for local people affected by the disaster. Many migrant wage-labourers were not registered in their districts, and found it hard to prove residence to obtain housing grants. Many families moved to the major cities within about three months.

M. Implications for development

The disaster had major impacts on development activity:

Losses

The disaster resulted in massive losses for the region and the country as a whole. These losses took a number of forms. *First, there was great destruction of productive capital facilities and infrastructure, and their loss as development resources:* these included factories, telecommunications, bridges, roads, ports, power systems and telecommunications, boats, and agricultural equipment. A feature of the disaster was the high level of damage to the contents of industrial structures, by flooding, wind, or debris. Another feature was the extent of damage to "network" systems such as telecommunications, and electric power transmission.

There was also widespread damage to agricultural resources, particularly tree crops, and productive land (from salt-water).

Second there were indirect, or "knock-on" effects and associated costs, stemming from loss of infrastructure, disruption of inputs, loss of production time, disorganization, and the need to clean up. Transport problems accounted for high costs here, with circuitous routings and the need for intermode transfers. A particular feature of this region also was the dependence of some areas on large-scale tourism. The disaster occurred outside the main tourist season, but the subsequent loss of bookings, and decline in tourist revenue brought a reduction or cessation of income to thousands of local people. The Tourism Ministry calculated that for every six month delay in return to operation, involving facilities capable of handling 1000 tourists a week, 20 million dollars in income would be lost by the operators. In the last year, the affected region had hosted 260,000 foreign tourists.

Third, there were losses that were harder to assign specific costs to, including at least three thousand deaths (many amongst family heads and breadwinners), perhaps ten thousand injuries (mostly relatively minor), and damage to the country's heritage (churches, temples, a museum, and an archeological site).

Fourth, there was widespread disruption of everyday life, including education (many schools were closed for weeks), normal social activity (travel was disrupted for several weeks), and a high level of general stress as the population struggled to adapt. The costs of all these were undoubtedly high, but hard to quantify with confidence.

Fifth, there were macro effects for the country as a whole: inflation, balance of payment problems, fiscal expenditure increases, and a decrease in monetary reserves. The long-term outcome was an increase in the debt burden, less investment, lowering of economic growth, and delays to new development programmes. In the latter case again, a decline in tourist investment was a high cost element.

Another major developmental impact was the *interruption of normal development programmes*. There was a shift in manpower resources away from development activity to more visible short-term recovery tasks (mainly for political reasons).

The investment climate was not helped by the disaster. The perception by institutional investors was that government had not organized a particularly speedy or effective response, and the lack of prior planning was obvious to all. A number of critical articles in leading investment journals covering the region added to this intangible sense of discomfort over large-scale investment.

The non-formal sector - a potential engine of recovery - benefited little from the organized response. Loss of shelter and tools affected large numbers of skilled and rather energetic artisans. The commercial credit sector had no effective mechanism for providing assistance. Most were forced to take credit from local money lenders at high rates of interest, at a time when income was reduced and the prices of raw materials was increasing. Those who were able to work, reconstructing domestic housing for example, received little technical support or additional training in low-cost mitigation methods (which some NGO staff had proposed linking to low interest credit schemes). Generally, in this sector, opportunities for improving protection at low cost were mostly missed.

In the recovery period, one of the prime challenges faced by the Government was the need to plan reconstruction projects with close consideration of the likely developmental status of the affected area over the next five to ten years. It had to ensure that reconstruction meshed with the regional development strategy as a whole. At the same time, it needed to reassess development priorities in relation to the hazard environment and reconstruction potential.

The Government also faced the challenge of shifting the focus for prioritizing and planning of rehabilitation to the provincial and district level. Simultaneously, however, it needed to maintain the financial approval and controls, overall budgeting, evaluation, and co-ordination at the national level.

Thirdly, it faced the challenge of encouraging government departments and NGOs to participate in community-sponsored mitigation programmes. The main instrument for this was NGO participatory programmes. One feature of the later stages of recovery was the way local NGOs and citizen groups in some areas started to collaborate to lobby for a more comprehensive approach by the provincial government to mitigation measures. The governments needed to respond positively to this with a range of supporting actions.

Fourth there was a parallel challenge to international organizations such as UNDP and UNDRO to find ways of relating to these local efforts. Possibilities included locally focused research initiatives, such as hazard mapping, technical advice, and organization development and support for professionals working within local NGOs. An additional, more difficult option was support for programme evaluation and network building.

N. Lessons Learned: Programmes Contributing Positively to Preparedness

A subsequent comprehensive review of the performance of the emergency response system highlighted a wide range of lessons, only some of which have been included in this case study analysis. Overall, prior emergency preparedness had been weak, and during the warning period itself only a small proportion of the required actions were actually taken. However, this generally dismal overall picture disguised a number of pre-disaster measures (including in particular, a number of attempts to ensure that critical sets of data would be available when needed) that did contribute substantially to later effective actions, either during the early relief period, or later on during the rehabilitation and recovery. Among the more successful programmes were:

1. *An UNDRO sponsored project for mapping of high risk communities.* This focused particularly on:
 - a) urban low-income neighbourhoods;
 - b) coastal villages;
 - c) villages on flood plains;
 - d) villages on steep hillsides susceptible to landslides
 - e) villages on low-lying river deltas
 - f) villages on barrier islands
2. *A prototype Red Cross project in two districts, based partly on the UNDRO study.* This involved the identification and selection of buildings providing good protection in cyclones. A detailed survey was carried out by an architect, working in conjunction with representatives of a wide range of different community organizations. Selected buildings were marked, and information on their location was provided regularly to local populations by local Red Cross workers engaged in first aid and primary health care projects. Efforts were made to upgrade water tanks and sanitation facilities at these buildings. Shelter managers (usually head teachers or local government officials) were appointed and given a small fee. Local Red Cross branches were given the responsibility to provide back-up power generators for lighting, and to deliver clean water. Despite some earlier criticism, this project largely succeeded, in part because of the leadership provided by its organiser, and in part because of the extensive consultations with community groups which were made before it started.
3. *A prototype agricultural preparedness project and disaster recovery studies at the regional disaster management centre,* supported by several donors including UNDP and USAID. This maintained a database of agricultural associations and growers' co-operatives, lists of NGOs working with farmers, information on agricultural produce processing facilities (Eg. grain mills etc), and a database of background information on farming practice in several areas of the country. One study area was in the disaster zone, and had been in progress for two years, focusing mainly on flood risks in the south of the region. It provided development staff from donors and

NGOs with many informal contacts with local officials, and lists of key people in the local agricultural community. It was an invaluable source for recovery planning.

4. *Recent investment in a medical communications network, linking local clinics and main hospitals.* Special attention had been given to provision of battery powered equipment, airdrops which could be dismantled and erected quickly and easily, and ways of providing waterproof protection for the sets themselves. Equally, more attention than usual was given to training staff in maintenance and operation of the equipment. In the event, this network allowed rapid inventory of damage to medical facilities, and a review of the capacity of the surviving system. Also, it permitted rapid reporting of injuries. A feature of this network was the extent to which it was combined with local support for a radio amateur emergency network (to which a number of doctors and medical administrators belonged) for which the health ministry gave useful informal support, training, and small grants for incidental expenses.
5. *A special project for emergency protection of disease control programmes, including human and animal vector-borne disease control activities.* Included in the budget for this project was a line item making provision for emergency grants to personnel who had lost housing or basic possessions, and for support to family members to allow the worker to return quickly to his or her job. Other measures included equipment and procedures for the protection of records against storm damage, strengthening of project buildings (including equipment stores), and measures to ensure that vehicles remained undamaged.
6. *A UNDP sponsored study of critical industry in cyclone-prone regions of the country.* This included collaboration with the department of economics at the national university on a model of regional inter-industry flows. It concentrated, amongst other issues, on the extent to which large producers were concentrated in high risk locations; their dependence on inputs of electric power or oil products; their dependence on local industries for critical inputs; the extent to which essential local transport links were susceptible to disruption; and the opportunities for input substitution.
7. *A review of damage compilation systems,* carried out in conjunction with the UN Economic Commission for the region. This reviewed data collection requirements for national and provincial planning in the aftermath of a major disaster, particularly for economic recovery planning. It helped focus attention on the need for standardised formats for data collection and reporting, and the need for developing procedures and training for data collection and handling in an actual emergency. After a training programme at a regional centre, six staff members of the Ministry of Finance were able to develop a prototype reporting system, which formed the basis of the system used later in the recovery from the disaster. A consortium of international agencies later joined with the Ministry and the national insurance association in sponsoring the development of a training course for assessment personnel in a number of specialist areas, including public works facilities, crops, livestock, rail systems, telecommunications, water supply, and electric power, and harbours and ports. The Department of Trade and Industry was preparing a separate

course focusing on assessing damage to industrial plant. The first of these had just begun as the disaster developed.

8. *A basic course for Provincial Governors at the administrative staff college.* This focused on emergency decision making, and on the need for identifying crucial decisions about rehabilitation which needed to be made during the first two weeks of an emergency.
9. *The formation and training of the UN-Disaster Management Team.*
10. *The formation and training of joint damage assessment teams* made up of personnel from the Police, Armed Forces, UN and national Red Cross Society. Arrangements were made to ensure that helicopter transport and communications equipment would be available for these teams at short notice.
11. *Prior planning within the Ministry of Health for a detailed sample survey of cyclone-affected areas (see later).*
12. *A programme of disaster epidemiology courses, within the Ministry of Health, but open to personnel from the national Red Cross Society, and other NGOs.* An active attempt to reach out to the heads of some of the national NGOs was instrumental in helping to focus some of their responses during the disaster on activities which were actually likely to achieve some degree of practical benefit.

O. Subsequent mitigation projects initiated as a consequence of the disaster

A range of mitigation projects were begun directly as a result of the experience of the Cyclone, including infrastructure protection, new building programmes, and special training initiatives.

Infrastructure Protection

A special focus of mitigation activity was on infrastructure protection and "lifeline" engineering. A change in policy within the Ministry of Telecommunications resulted in a directive to ensure that new towers and masts for microwave and other radio communications were designed to give higher resistance to strong winds. Some attempts were also made to strengthen existing communications towers, with extra stays, and better maintenance and repairs. Telecommunications providers were also required to build in higher levels of protection for ancillary equipment. A programme to upgrade and maintain over-ground telephone poles was started. The storm reinforced an existing trend to move away from microwave communications to fibre-optic and satellite links. New telephone exchanges were also required to have higher levels of protection against wind, debris, and flooding.

The Electricity Corporation made a few improvements, notably a new design of transmission pylon, and an upgrading of circuit-breaker equipment. Computerised control equipment in power stations and switching centres were given some extra protection, mainly by shifting them to inner rooms in the buildings. The standard for new buildings housing this equipment was improved.

Government buildings were not substantially improved. However, those Provincial Offices housing Emergency Operations Centres were given strengthened roofs and window frames, and the locations of the centres moved to upper floors.

During repairs to existing hospitals, some attempt was made to strengthen a core of inner rooms as a refuge. Roofing was strengthened (with additional nails, ties, and beam connections). Buildings housing generators, fuel, and water tanks were reinforced or reconstructed.

The design standard for new hospitals and clinics was improved somewhat, to incorporate wind resistance and a stronger complement of fittings.

The opportunity to reconstruct or reinforce wind-resistant schools was not followed through. The shape of these buildings - narrow, with long spans - presented special problems, and upgrading was (erroneously) perceived to be too expensive. An attempt was made in the national budget to add provision to upgrade the level of regular maintenance (itself a useful measure to sustain effective levels of mitigation). However, this was later quickly cut back.

Changes in Planning Laws

Within three months, the country's legislature had approved a change in planning laws to allow planning department to set conditions for design and construction when issuing building permits. The National Homebuilding Code focused on five elements: plan shape; construction materials; roof construction (shape, materials, and fixing); walls; and windows and doors. This attempt to strengthen building codes proved to be somewhat late, and was in any case hard to enforce. Many structures were repaired or reconstructed within weeks. There was a corresponding code for industrial buildings. The impact of the legislative change was, in fact, greater on industrial plant than on domestic or public buildings. Nonetheless, it was a useful starting point, and its application was gradually extended over the next few years. A spin-off from this effort was the training programme in cyclone-resistant construction incorporated into training colleges for engineers, builders, and architects.

Training Initiatives

At the national level, the government and UNDP/UNDRO jointly sponsored a Risk Assessment and Mitigation Project, which aimed to train national and provincial planners in risk assessment and mitigation techniques. These courses paid special attention to lifeline network analysis and vulnerability assessment, within an overall economic context. Planners were taught how to assess the economic implications of disruptions to regional network systems, and how to plan large scale capital investments in ways which minimised the likelihood of such disruption. They were also shown how to monitor mitigation activities.