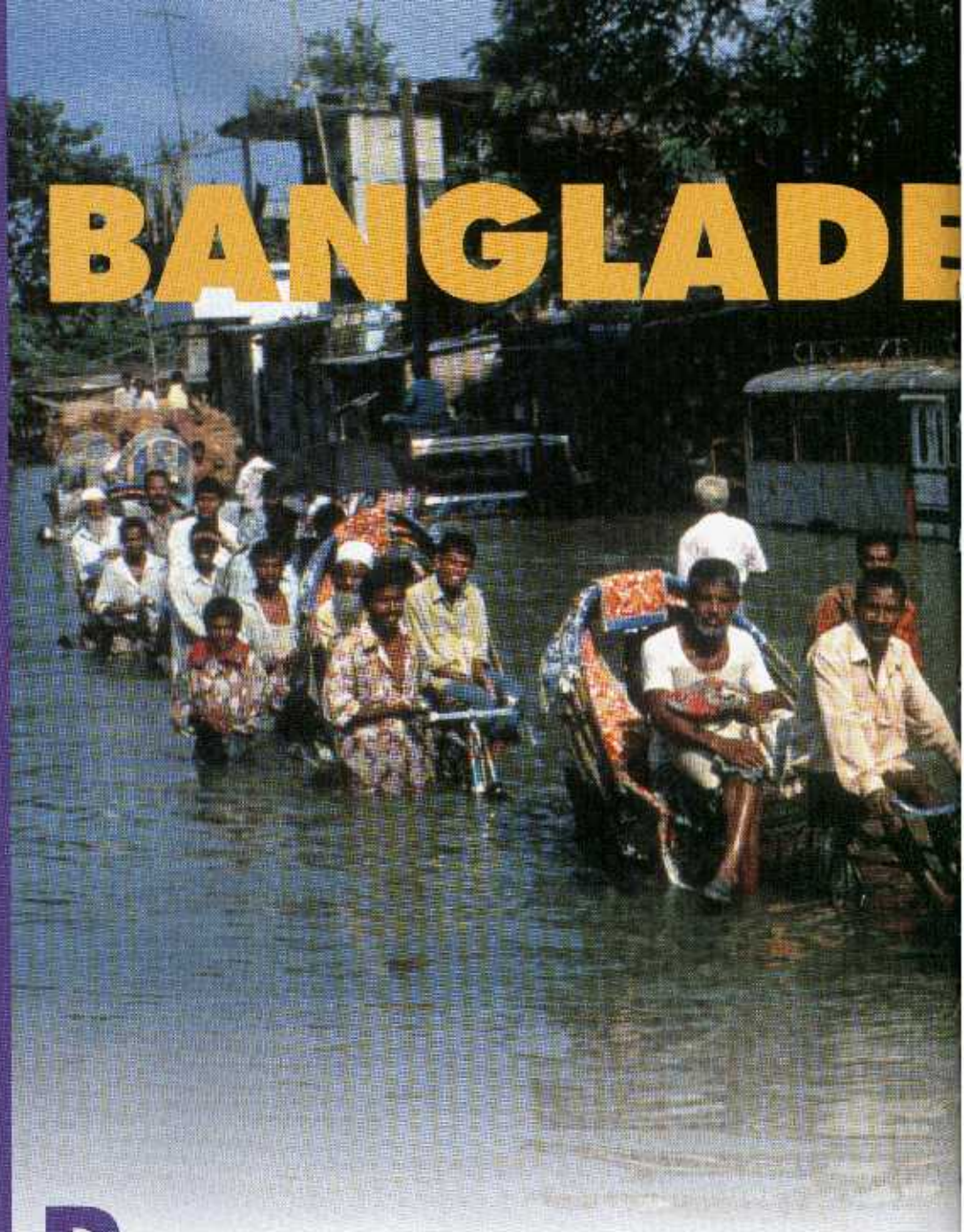
perhaps land-use controls in place and any new flood plain management scheme will have to incorporate them or modify them.

During a flood, advanced warning will be required so that countermeasures can be undertaken in time. The flood plain map and the larger management scheme of which it forms a part will indicate where and how far in advance warnings will be needed. Forecast requirements can be developed to ensure that these warnings are available in time and the requirements are used to develop a flood forecasting system, which will not only give advanced warning of when a flood will occur, but will also provide detailed information during the flood for controlling flood defence structures and for directing the flood-fighting operations.

All strategies for prevention of risks induced by floods should be developed starting from the following statement. The flood plain is the area that is flooded by the river and it is inevitable that sooner or later it will be flooded, despite the erection of costly flood defence structures. It needs to be managed with this point in mind and this means, in particular, control of development on the flood plain. A flood plain map, showing areas flooded with a certain frequency, is an indispensable aid to managing the flood plain. Though floods occur on the flood plain, they are the result of runoff further upstream and the conservation of the catchment can greatly reduce the size of floods. There must be a plan for fighting floods when they occur and this should include a flood forecasting system. Post-flood disaster relief and recovery need to be included in the general disaster relief and recovery system of the community.

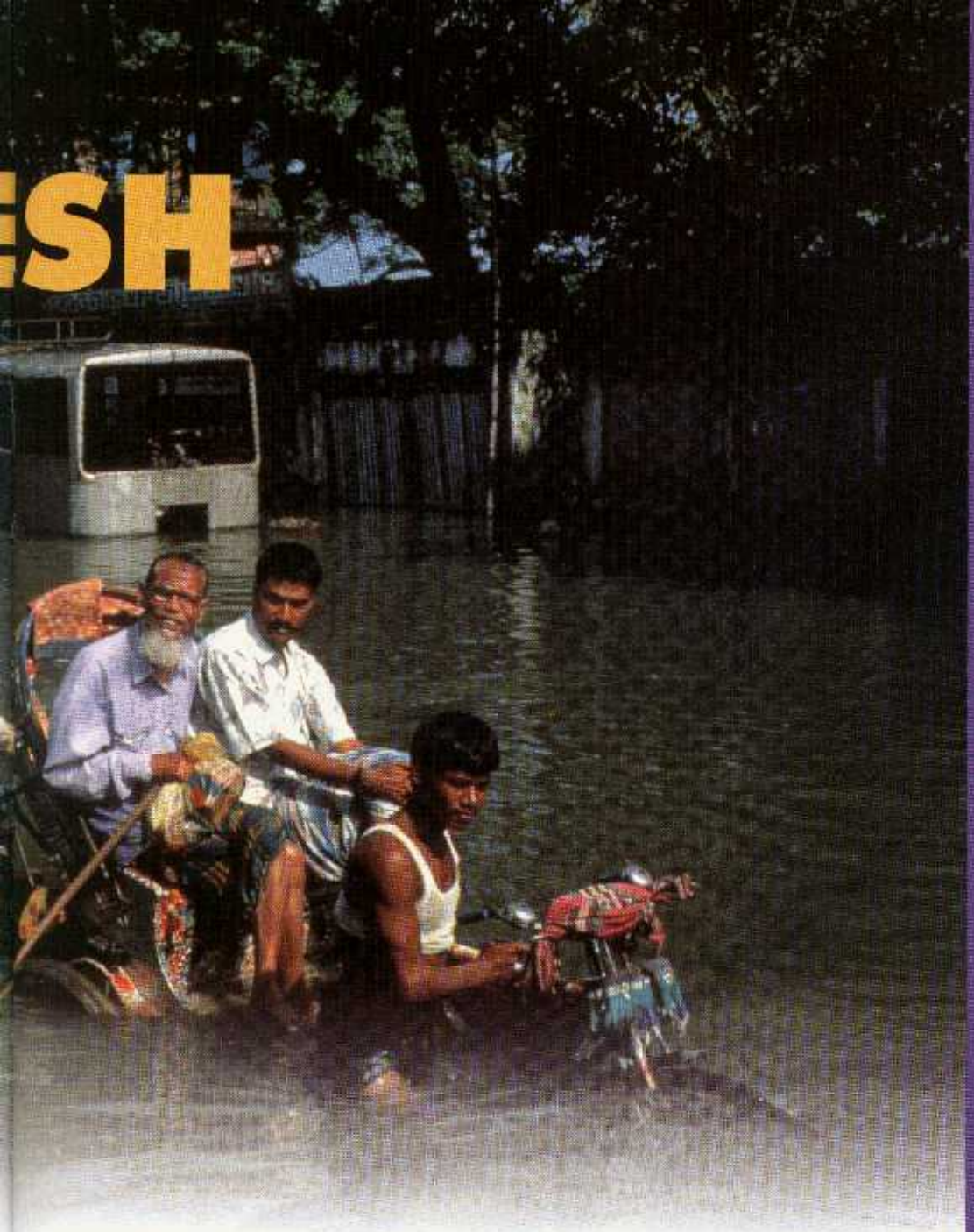
Floods in Lisbon, November 1983

BANGLADE



Bangladesh lies in the combined delta of the Ganges, Brahmaputra and Meghna river basins which have a total drainage area of 1.5 million km^2. These rivers, fed by snowmelt from the Himalayas and the abundant monsoon rains, flood at least a fifth of Bangladesh each year during the monsoon. The floods are of value to the land and renew fish stocks, groundwater and soil. The copious supplies of silt (2 billion tons per year) fertilize the flooded fields enabling Bangladeshi farmers to grow up to three rice crops per year. The floods also alter river courses and deposit silt to create ephemeral islands, called chars, that may last for several years before being swept away in a new flood dispossessing the farmers who had settled there.

Some 4,000 km of dykes have been built in an attempt to protect the land, but these are frequently breached. The most serious of the recent monsoon floods, that of 1988, flooded two thirds of Bangladesh for six weeks. As well as these regular floods in the monsoon season, Bangladesh is also prone to storm surges. Two recent severe storm surges in 1970 and 1991 are described in chapter 2 of the main text. As well as causing a greater depth of flooding than the monsoon, storm surges bring sea water into the delta which damages the fertil-



Flooded Street, Bangladesh Naogaon City. *Still Pictures. G. Mot*

ity of the soil. By and large, the country can cope with the normal monsoon flood, which as noted, brings considerable benefits. The serious damage and loss of life are caused by the storm surges associated with tropical cyclones and the occasional large monsoon flood like that of 1988.

Following the floods of 1988, Bangladesh started developing, with the World Bank and other international agencies, a Flood Action Plan (FAP) to control the rivers. The scale of this plan is massive. By 1993, some 26 studies and pilot projects were under way at a cost of US$ 150 million over five years. These studies will provide information for the final design, the long term aim of which is to control the river with an enormous complex of dykes, dams and diversions. Following the floods of 1988, Bangladesh started developing, with the World Bank and other international agencies, a Flood Action Plan (FAP) to control the rivers. The scale of this plan is massive. By 1993, some 26 studies and pilot projects were under way at cost of US$ 150 million over five years. These studies will provide information for the final design, the long term aim of which is to control the river with an enormous complex of dykes, dams and diversions while maintaining the value provided by the floods in renewing fish stocks, groundwater and soil fertility.