Section 3

The Flood Hazard

In this section .....

Floods: Glossary of Key Terms

Barrages: Structures built across rivers to control and regulate flow.

Channel modification: The deepening and/or widening of a river, and the removal of obstructions, so that the river can flow more freely and be less likely to flood.

Evapotranspiration: The release of water vapour from the earth's surface by evaporation (from free water surfaces) and transpiration (from plants).

Flash-floods: Floods characterised by an extremely rapid rise in water level usually resulting from short, intense bursts of rainfall (e.g as a result of a thunderstorm).

Floodplain: A plain, bordering a river, which has been formed from deposits of sediment carried down by the river.

Floodplain zoning: A method of flood protection which involves the prohibiting or restricting of certain land uses in areas where the flood risk is high.

Flood-proofing: Building construction measures which help prevent floodwaters from entering properties.

Groundwater: Water held underground in soil and rock.

Groundwater flow: The downslope movent of water deep below the soil surface.

Infiltration: The process of water soaking into rocks and soil.

Levees: In flood protection, human-made banks flanking a river which are designed to confine floodwater to the part of the floodplain where it will cause least damage.

Precipitation: The deposits of water, in either liquid or solid form, which reach the earth from the atmosphere.

Rapid-onset floods: Floods characterised by a rapid rise in water level, often occurring where rivers flow rapidly through narrow valleys.

River diversion: Channelling of a river in a different direction to reduce the risk of flooding and flood damage.

Run-off: The downhill movement of water on the ground surface.

Slow-onset floods: Floods characterised by the slow rise and fall of water level (over a period of weeks or even months). Common where rivers flow across lowland areas.

Throughflow: The movement downslope of water below the soil surface

Water cycle: The circulation of water from sea, to atmosphere, to land and back to sea, and its transformation between the gaseous, liquid and solid forms.

Types of Flooding

Figure 1

Figure 2

HAZARD DATA

Floods can be classfied according to the speed at which floodwaters rise. They fall into three caregories:

- **Slow-onset floods:** Flooding of rivers in low-lying areas, such as central and western NSW and Queensland, as well as northern South Autralia and parts of Western Australia, may last for weeks or even months. Floods in these areas can lead to major losses of stock and damage to crops as well as extensive damage to road and rail links.
- **Rapid-onset floods:** Flooding occurs more quickly in the mountain headwater areas of larger rivers as well as in the rivers draining to Australia's east coast. The ground here is steeper and so rivers drain more quickly. Flooding may therefore only last for one or two day. These floods are potentially much more damaging to life and property since there is generally much less time to take preventative action.
- **Flash-floods:** Flash-flooding results from relatively short, intense bursts of rainfall, often as a result of thunderstorm activity This type of flooding poses the greatest threat to loss of life and can result in significant damage to property and major social disruption Flash-floods are a serious problem in cities where drainage systems are unable to cope

Storms and cyclones, especially in northern Australia, can cause vast areas to flood. Damage may be limited to property and stock losses, but in some of the most severe cases, human life may be lost through drowning or fatal injuries sustained by people caught in flash-floods.

adapted from 'Hazards, Disasters and Survival', Natural Disasters Organisation, 1992

Activities

1 Study the photographs, Figures 1, 2 and 3.
   a Classify each of the scenes shown as *slow-onset, rapid-onset* or *flash-flooding*. In each case give reasons for your answer.
   b Which of the floods is likely to have brought long-term benefits to the area affected? What benefits might it have brought?
   c Choose one of the photographs, and use it as the basis for a short newspaper report. Your report should indicate the conditions leading up to the flood, its speed of onset and the damage that it caused.

2 Why might damage to road and rail links be particularly important in those areas of Australia which experience slow-onset floods?

3 Why are rapid-onset floods likely in (i) the headwater regions of major rivers and (ii) rivers draining to Australia's east coast?

Figure 3

4 Suggest at least two reasons why flash-flooding is most likely to occur in city areas

5 a Explain how tropical cyclones can cause flooding.
   b Apart from cyclones, name two other natural hazards which can be linked to flooding. Explain the link in each case.

The Causes of Flooding

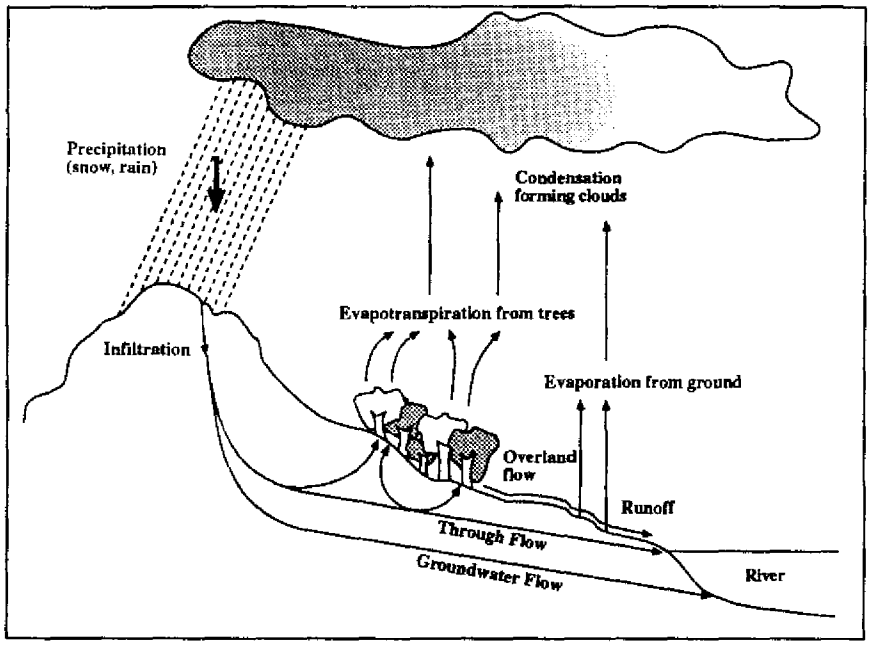


Figure 1: The water cycle in the drainage basin of a river

- **Heavy rain** - Rapid downpours associated with thunderstorms and prolonged heavy rainfall (particularly in the catchments of rivers) commonly lead to flooding.
- **Dam bursts** - The failure of a dam wall can cause rapid and devastating floods to people living in the valley below.
- **Tsunamis** - These large ocean waves caused by earthquakes and volcanoes at sea can swamp coastal areas.
- **Storm surges** - Whipped up by tropical cyclones, these ocean waves can cause serious damage to coastal areas.
- **Deforestation** - The loss of vegetation on slopes can lead to more rapid run-off into rivers and so increase the risk of flooding.
- **Snowmelt** - When heavy accumulations of snow melt rapidly, the additional water supply to rivers may cause them to overflow their banks.
- **Deposition of silt** - Where rivers have been made more shallow by heavy silt deposits flooding is more likely.
- **Global warming** - It is suggested that an increase in 'the greenhouse effect' may lead to global warming, which in turn may expand ocean waters and cause widespread coastal flooding.

Figure 2: Some causes of flooding

Activities

1 a Find out the meanings of each of the following processes shown in Figure 1:
water cycle, groundwater flow, throughflow, run-off, evapotranspiration, infiltration, precipitation.

b Using Figure 1 to help you, insert each of these words into the gaps in the paragraph which follows: *groundwater, drainage, floodplains, throughflow, atmosphere, infiltration, run-off, flooding, volume.*

Floods most often result from the overflow of rivers onto their ..... . The..... of water in a river depends on the amount of precipitation which falls onto the river's ..... basin. This water may be returned to the ..... by the process of evapotranspiration, soak into the ground as a result of ..... or flow over the land as ..... . Water which soaks into the ground may move through the soil either close to the surface as ..... or much deeper as ..... flow eventually contributing to a rise in river level and possible ..... .

2 Study the information in Figure 2:
a Classify the causes of flooding shown as either (i) natural or (ii) result of human activity. Which causes were difficult to classify? Explain your answer.
b Which of the causes shown might lead to a river overflowing its banks?
c List three possible causes of coastal flooding.
d Explain how deforestation can contribute to flooding. How might deforestation also be linked to excessive silt being deposited in rivers?
e Explain how flooding can be linked to each of the following hazards:
- soil erosion
- earthquakes
- tropical cyclones
- air pollution by 'greenhouse gases'.

The Destructive Effects of Floods

FLOODS: Causes of destruction and places most at risk

Inundation and the sheer weight and pressure of rapidly flowing water are major agents of destruction. Currents and turbulent water can knock down and drown people and animals in relatively shallow depths. Debris carried by the water can also cause injury and destruction. Buildings are damaged by the undermining of foundations. Mud, oil and other pollutants carried by the water can ruin crops , damage building contents and contaminate water supplies. Sewerage systems may be destroyed and diseases may be spread by the floodwaters. Saturation of soils may cause landslides or subsidence (collapsing of the ground).

For river flooding, anything located within the floodplain is at risk. If flooding is caused by tsunamis or storm surges, coastal areas will suffer most damage. Underground buildings and basements, buildings made of earth or constructed using water-soluble mortar and buildings with shallow foundations or with weak resistance to the impact of water against their walls, are all vulnerable to flood damage. Utilities such as power, gas and water supply are also at risk. Machinery and electronics may suffer damage resulting in communications failures and economic losses for industry. Fishing and other maritime industries may be particularly badly affected. Food stocks may be damaged by floodwaters and depleted by the losses of penned/confined livestock and damage to crops. Sites and artifacts of cultural and historical significance may also be damaged or lost.

Figure 1

Activities

Fill in the blanks in the following sentences using information in Figure 1. Check your answers by finding them in the puzzle on the right.

1 A major cause of death during a flood is _ _ _ _ _ _ _ _
2 Two of the pollutants which may be carried by floodwaters are _ _ _ and _ _ _
3 _ _ _ _ _ _ _ _ and _ _ _ _ _ _ _ _ _ water can knock down and drown people and animals.
4 The _ _ _ _ _ _ carried by floodwaters can cause damage and injury.
5 Buildings with shallow _ _ _ _ _ _ _ _ _ _ _, _ _ _ _ walls, water-soluble _ _ _ _ _ _ or constructed of _ _ _ _ _ are all at risk of flood damage.
6 If _ _ _ _ _ _ _ _ systems are damaged, _ _ _ _ _ supplies may become contaminated and the spread of _ _ _ _ _ _ _ may follow.
7 The _ _ _ _ _ _ _ _ _ _ of soil may lead to _ _ _ _ _ _ _ _ _ _ and subsidence.
8 Places located within the _ _ _ _ _ _ _ _ _ _ _ of rivers are particularly vulnerable to flood damage.
9 _ _ _ _ _ supplies may be cut off during flooding.
10 Food supplies may be depleted by losses of _ _ _ _ _ _ livestock and damage to _ _ _ _ _.
11 Drowning may still occur, even though the _ _ _ _ _ of floodwaters is relatively shallow.
12 The loss of _ _ _ _ _ _ _ _ artifacts is one type of flood damage which cannot be repaired.

D	C	U	R	R	E	N	T	S	S	O	C
T	R	M	A	P	S	E	F	I	A	I	S
U	S	O	O	E	A	A	I	R	T	L	L
R	E	R	W	N	E	R	S	B	U	A	A
B	W	T	R	N	S	T	H	E	R	R	N
U	E	A	E	E	I	H	I	D	A	U	D
L	R	R	T	D	D	N	N	E	T	T	S
E	A	E	A	M	U	D	G	P	I	L	L
N	G	L	W	E	A	K	T	T	O	U	I
T	E	C	R	O	P	S	A	H	N	C	D
F	L	O	O	D	P	L	A	I	N	S	E
F	O	U	N	D	A	T	I	O	N	S	S

13 The _ _ _ _ _ _ _ industry may be particularly badly affected by flooding.

The remaining letters form a word which desribes the areas most affected by floods caused by tsunamis or storm surges .

_ _ _ _ _ _ _

Case Study: The 'Great Floods' of 1990

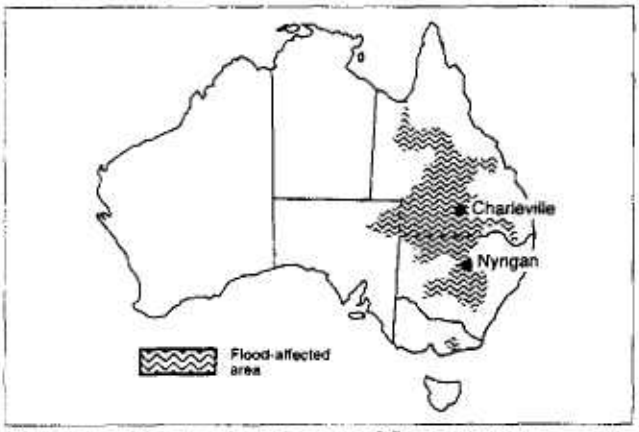


Figure 1: Map showing the extent of floods in eastern Australia, April/May 1990

Summary of the disaster

The April/May 1990 floods in eastern Australia were huge. They covered more than one million square kilometres of Queensland and New South Wales and a smaller area of Victoria (in a separate extreme flood). Figure 1 shows the extent of the floods - an area as large as France!

Causes - In central-northern NSW and central-southern Queensland continual, heavy rains partly caused by cyclones, drenched the flat inland plains. Then further torrential rain created instant floods. Many rivers had already been flooded once and were in flood again at even higher levels.

Effects - In both states, road and rail links were severed for long periods. Towns were invaded by floodwaters and many communities were isolated. Nyngan in NSW and Charleville in Queensland (Figure 2) were particularly badly affected. In these two towns most residents were evacuated by air as more than 2,000 homes and public buildings suffered serious damage. Graziers faced a grim submergence of entire properties from river overflows, while stock deaths of up to one million were estimated. Emergency services were stretched to the limit to provide essential relief.

Cost - The Great Floods of 1990 claimed six lives and cost the country a total of approximately $350 million, most of which was unable to be insured.

Figure 2: Charleville in flood, 1990

Figure 3: Evacuation scene, Charleville, 1990

Figure 4: Delivering emergency stock fodder during the 1990 floods in NSW

Activities

1 Study the scenes in Figures 2 and 3. Imagine that you were a resident of Charleville at the time of the 1990 floods. Tell the story of your experiences, including your evacuation from the town and your return home.

2 Study the scene in Figure 4. List at least four problems farmers in flood-affected areas would have faced during and after the 1990 floods.

3 a Some residents of Nyngan waited for several months before authorities allowed them to return to their homes. Why do you think this was the case?

b One journalist commented that the Nyngan floods *will leave their physical and psychological marks for years to come.* What do you think the journalist meant by this comment?

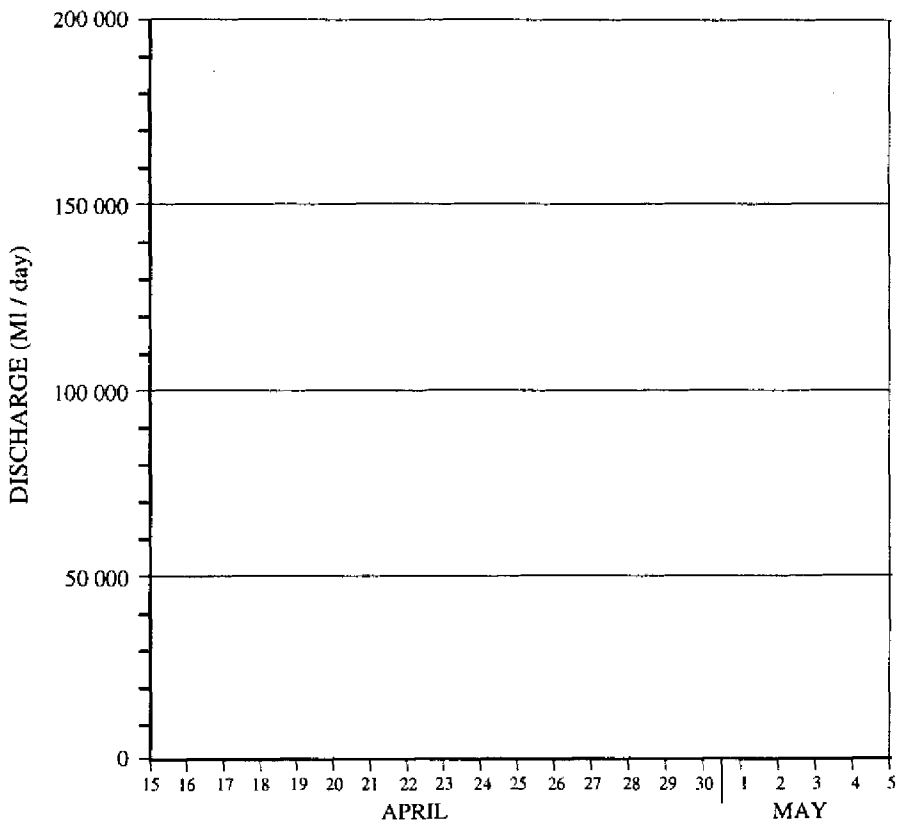
contd.....

Case Study: The 'Great Floods' of 1990 (contd)

a.

Date		Discharge Ml/day#
April, 1990	15	8 000
	16	11 000
	17	14 000
	18	31 500
	19	49 500
	20	67 000
	21	60 000
	22	63 500
	23	76 000
	24	180 000
	25	129 000
	26	85 000
	27	58 000
	28	42 500
	29	33 500
	30	27 000
May, 1990	1	19 000
	2	16 000
	3	11 000
	4	8 500
	5	7 500

b.



'Discharge' is the volume of water passing a given point in a given time. This is normally measured in megalitres per day (Ml/day.) 1 megalitre = 1000 litres
* River 'height' refers to the height of the water surface, measured using a graduated gauge.

Figure 5: a Discharge readings for Bogan River at Nyngan, NSW, April and May 1990
b Flood hydrograph for Bogan River at Nyngan

4 a Using the axes provided in Figure 5b above, graph the discharge levels for the Bogan River at Nyngan shown in Figure 5a.
(The graph you have drawn is called a 'flood hydrograph')

b The 'Summary of the Disaster' on the previous page refers to rivers reaching two flood peaks during this period. Is this evident from your hydrograph? If so, when did the peaks occur?

c Work on building up the levee banks around Nyngan was abandoned late on April 23, and an evacuation plan was put into place. From the discharge pattern shown in your hydrograph, why do you think (i) the levee work was abandoned and (ii) planned evacuation did not commence earlier?

d Most of the rain which produced the Nyngan floods fell in the catchment of the Bogan River from April 8-14, with some additional falls from April 18-22. How do you account for the river only reaching its peak discharge on April 24?

e In the period shown on your hydrograph, the Bogan River rose from a height* of about 3.5 metres on April 15, to a peak height of 5.23 metres on April 24. How do you account for a height increase of less than 70 per cent, when river discharge increased by more than 2,000 per cent for the same period?

f Dandoola, a gauge station on the Bogan River upstrem from Nygan recorded a greater peak height but a lower peak discharge than Nyngan. How do you account for this?

Controlling Floods

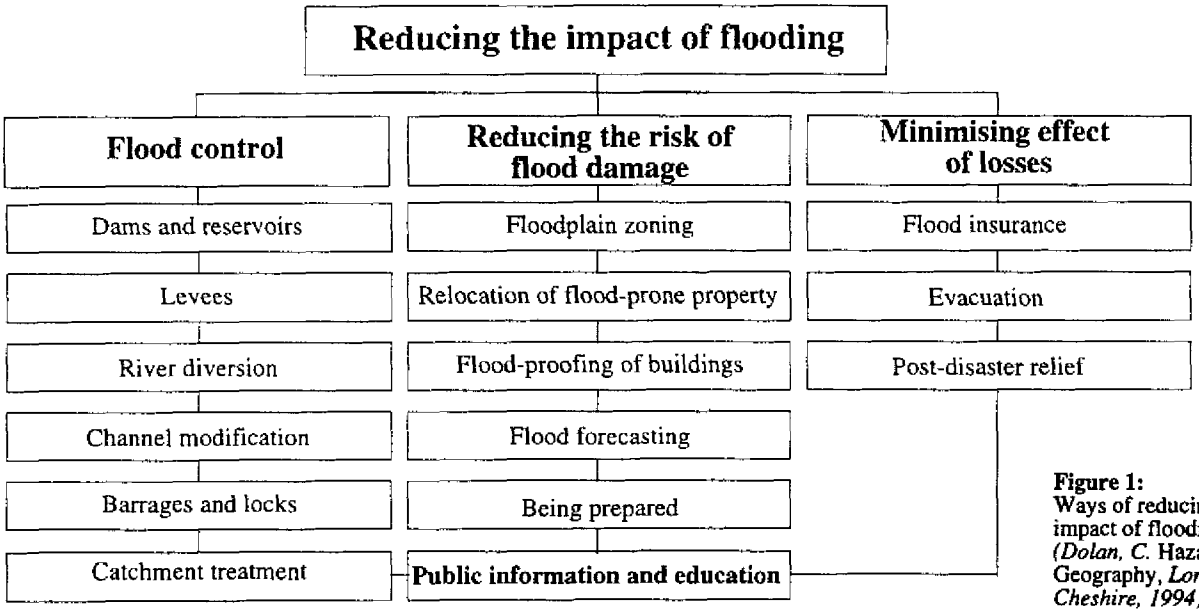


Figure 1: Ways of reducing the impact of flooding *(Dolan, C. Hazard Geography, Longman Cheshire, 1994)*

Activities

1 Study Figure 1.
   a Explain what is meant by each of the following, and how each works to help prevent flooding:
   levees, river diversion, channel modification, barrages and locks.
   b How do *dams* in the upstream areas of rivers help to control downstream flooding? What problems might result from relying on dams for flood control?
   c *Catchment treatment* involves making changes in the catchment area of a river to reduce the volume and speed of water flowing into the river. What is the 'catchment area' of a river? What changes could be made to a catchment area to reduce flooding?
   d What part do you think each of the following might play in *flood forecasting:*
      - satellite photographs and weather maps
      - soil moisture measurements
      - past records of flooding in an area.
   e Why do you think only a small portion of insurance policies in Australia cover loss or damage by floods?
   f Following a flood, what actions would be involved in *post-disaster relief* ?

Some measures for flood-proofing of buildings

- Shutters to prevent entry of floodwaters
- Construction on elevated stilts.
- Building of levee banks around building.
- Use of flood-resistant materials.
- Construction of water-proof walls around building.
- Using compacted fill to raise level of building foundations.
- Installation of a drainage sump and pump for disposal of sewage during flooding.

Figure 2

2 Study Figure 2, which lists flood-proof features which can be incorporated into the design of buildings. Design a house, which has a range of flood-proof features. On your design:
   - label all of the flood-proof features;
   - describe how each feature is intended to work;
   - show the flood level against which these features will offer protection;
   - describe the type of flooding which the features are designed to counter (e.g. river or coastal flooding, slow-onset or rapid-onset floods).

contd.....

Controlling Floods (contd)

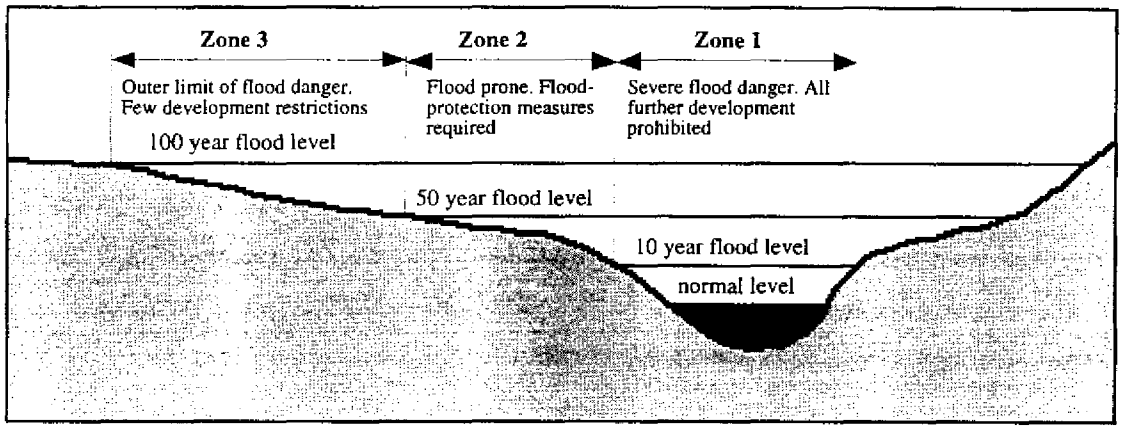
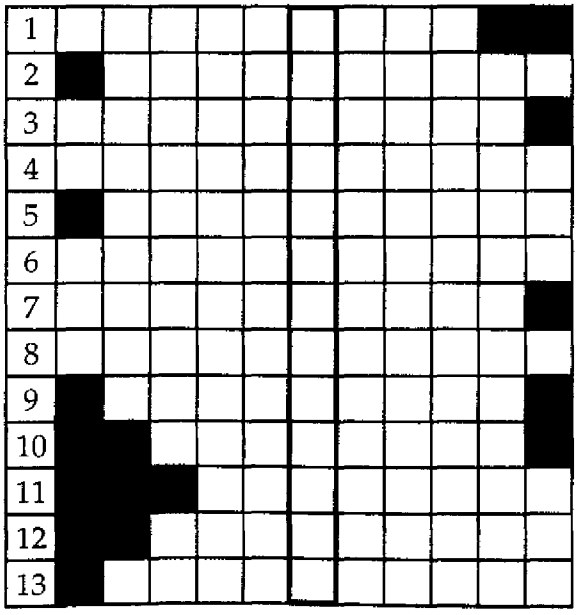


Figure 3: An example of floodplain zoning *(Dolan, C. Hazard Geography, Longman Cheshire, 1994)*

Activities (contd)

3 Figure 3 shows an example of floodplain zoning, a method used by local governments to prohibit certain land uses in flood-prone areas.
   a The flood levels shown on the diagram indicate 'return periods' for floods of certain heights. Explain what this means.
   b In which of the zones would you locate each of the following functions. Give a reason for your answer in each case.
      - A new housing development.
      - A linear park following the river.
      - A factory with flood-proof features.
   c In Zone 2 incentives are likely to be offered to attract 'low impact' functions. Explain what functions these might be.
   d In Zone 1, what could be done to protect existing developments (e.g. houses, factories) against flooding? What essential waterfront activities would need to remain in this zone?
   e Why do you think floodplain zoning would be difficult to enforce in major cities and towns?

4 Complete the puzzle on the left using the clues below. If solved correctly the centre column forms the name of a famous flood control structure.



Clues

1 Public _ _ _ _ _ _ _ _ is essential if people are to understand how to reduce the impact of flooding
2 A _ _ _ _ _ _ _ _ _ can be the most damaging flood because it occurs so quickly (2 words).
3 _ _ _ _ _ _ _ _ by boat or by air is a common emergency procedure in a major flood.
4 The _ _ _ _ _ _ _ _ _, Australia's biggest river, suffered a major flood in 1956 (2 words).
5 Dams offer _ _ _ _ _ _ _ _ _ against flooding.
6 _ _ _ _ _ _ _ _ _ are large ocean waves, whipped up by tropical cyclones, which can cause serious coastal flooding (2 words).
7 _ _ _ _ _ _ _ _ provide protection against river flooding by holding out flood-waters (2 words).
8 Flood _ _ _ _ _ _ _ _ _ helps people anticipate the impact of flooding.
9 Flood _ _ _ _ _ _ _ _ can help offset the cost of flood damage.
10 _ _ _ _ _ _ _, such as those on the River Murray, help control the flow of rivers.
11 _ _ _ _ _ _ _ is one of Australia's most flood-prone capital cities.
12 Channel _ _ _ _ _ _ _ _ allows rivers to be redirected away from flood prone areas.
13 _ _ _ _ _ _ _ _ _ of the soil leads to more run-off, increasing the risk of flooding.

contd.....

Controlling Floods (contd)

Flood protection in Nyngan and Warren : a comparitive study

Where did the floods occur?	The town of Nyngan on the Bogan River, New South Wales	The town of Warren, about 65 km from Nyngan on the Macquarie River.
When?	April 1990	August 1990
Existing flood protection	A levee bank a metre higher than the highest flood level ever recorded in Nyngan surrounded the town on three sides.	Levee banks similar to those protecting Nyngan.
Action taken before and during the floods	Raising and strengthening of the existing levees by filling and stacking 300 000 sandbags over the period of a week.	• Establishment of groups to handle earthworks, welfare, media liaison, floodboat rescue, levee patrol and assistance to farmers. • Building up of levees well before the floods, using all available machinery, and with help from an army unit. • Marking telephone poles at the level of the predicted peak. • Circulating daily information sheets on the state of the flood. • Moving hospital patients to other towns. • Devising an evacuation plan to transport the entire population away from Warren. • Breaching upstream agricultural levees to disperse floodwaters quicker.
Impact of the floods:	The levee broke and floodwaters swept into the town (photo above). Almost every building was flooded and 2,500 people were evacuated, mainly by helicopter. The flood caused damage estimated at $50 million.	In the end, the Warren levees held after they had been raised half a metre and made considerably wider. The building up of the levees was helped greatly by the use of heavy machinery and outside expertise.
Evaluation of protection:	The Nygan flood provided a clear example of the dangers of adopting a narrow approach to flood protection. In putting their faith in only one measure - the raising of levees with sandbags - the people of Nyngan overlooked other preparations. Few lifted belongings above the reach of floodwaters, no plan for evacuation was in place and little had been done to develop local flood information, expertise and awareness	Warren learnt a lot from the Nyngan experience four months earlier. Even if the levees had failed it is likely that the multi-dimensional response adopted by the town would have greatly reduced the impact of the floods.

Figure 4

Activities (contd)

5 Using information in Figure 4 , answer the following:

a Why is Nygan's approach to flood control described as 'narrow', while Warren's is described as 'multi-dimensional'?

b One writer commented that *Warren's greatest assets were the flood of April and Nyngan's experience at that time.* How did the Nyngan experience benefit the people of Warren?

c Explain why the levees at Warren were more effective in protecting the town than those at Nyngan.

d Explain the purposes of the following strategies used in Warren:

- marking telephone poles at the level of the predicted flood peak;
- circulating daily information sheets on the state of the flood;
- breaching upstream agricultural levees.

Case Study: Bangladesh

Figure 1: Mud dredgers on the Ganges River near Dhaka, Bangladesh. Their job is to dredge mud from the bottom of the river and use it to build up the land.

HAZARD DATA

Bangladesh is prone to flooding for a number of reasons:

- Much of the country lies on the huge floodplain of the Ganges, Brahmaputra and Meghna rivers.
- 70 per cent of land is less than a metre above sea level, with rivers, lakes and swamps covering 10 per cent .
- From April to September - the Monsoon season - south west winds bring enormous amounts of rain to Bangladesh and to the catchments of the rivers which flow through the country.
- Construction of embankments along major rivers in India has caused increases in the flow of water into Bangladesh.
- Tropical cyclones, common over the Bay of Bengal, whip up large ocean waves called storm surges which frequently inundate vast areas of the country's low-lying coast.

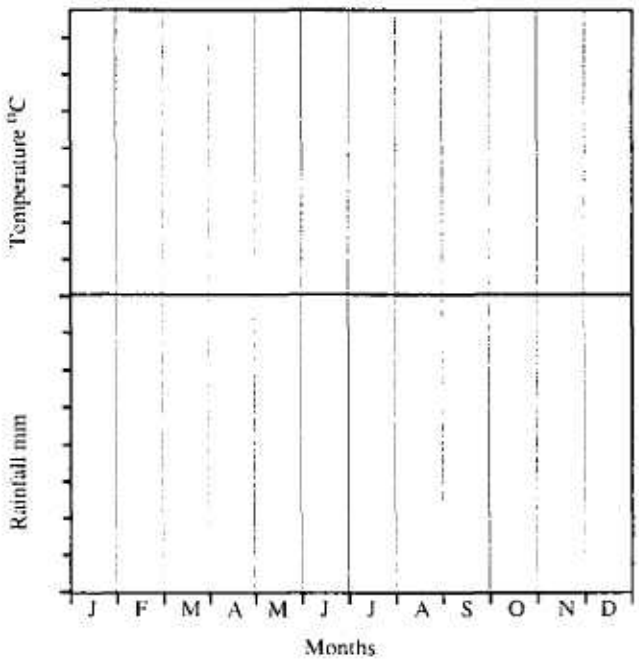
Increased flooding has also been linked to the clearing of trees in the Himalayas. Deforestation has increased the rate of run-off and the amount of silt being sent down river into Bangladesh. As a result river beds are raised and are less able to cope with the increased flow. Flooding becomes more frequent and more devestating.

Activities

1 Explain why Bangladeshis need to undertake the work shown in Figure 1. As well as building up the land how else would this work help reduce flood impact?

	J	F	M	A	M	J	J	A	S	O	N	D	Total annual rainfall
Temperature ^{o}C	22	24	28	32	32	30	29	30	30	29	25	24	
Rainfall mm	10	25	40	50	140	290	320	330	250	120	40	5	

2 Bangladesh has a monsoon climate. The table above shows temperature and rainfall figures for this type of climate.
   a Graph these figures on the axes provided.
   b Calculate the total annual rainfall and write it in the box at the end of the table.
   c From the graph, in which months is serious flooding most likely? What percentage of rainfall occurs in these months?



3 Bangladesh experiences its most serious floods when heavy rains fall in the catchment areas of the Ganges, Brahmaputra and Meghna rivers.
   a What is meant by 'catchment areas'?
   b Using an atlas, describe the location of the catchment areas for these three rivers.

4 How can the clearing of trees in the Himalayas be linked to more frequent and more devastating floods in Bangladesh?

contd.....

Case Study: Bangladesh (contd)

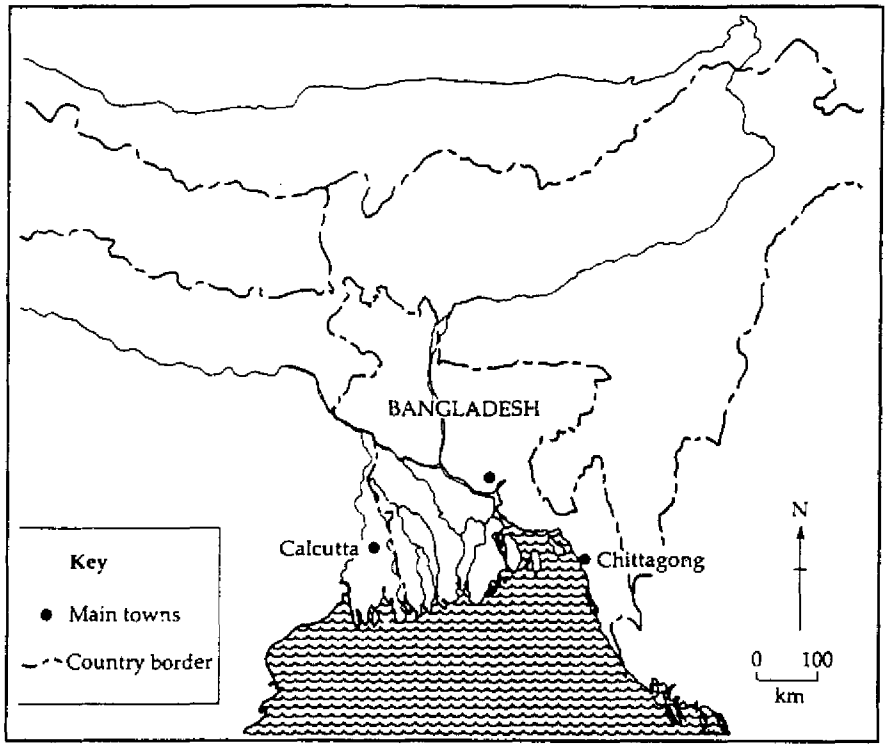


Figure 2: Bangladesh and surrounding countries

Activities (contd)

5 a Using an atlas, add the following to Figure 2:
- The Bay of Bengal.
- Dhaka.
- The Ganges and Brahmaputra rivers.
- India, Nepal, Burma and Tibet.
- The Himalayas.
- Arrows showing how storm surges move up the Bay of Bengal to strike the coast.

6 One author commented that Bangladesh experiences floods 'through both the front and back doors'. Using your atlas and the information in 'Hazard Data' explain what this means?

7 How might each of the following contribute to the impact of this flooding by a storm surge moving up the Bay of Bengal:
- The triangular shape of the Bay of Bengal (see Figure 2).
- The very high population density in the affected area - 10 million people are packed into an area smaller than the size of Tasmania.
- The fact that many people live on alluvial islands built by deposits from the Ganges and Brahmaputra Rivers, often less than a metre above high tide level.

8 Read the following eyewitness account of a storm surge which struck Bangladesh in 1991.

When it (the wind) turned around to reach the sea the water came with a booming sound. A giant wave lifted us up and we grabbed hold of a branch of a tree. Waves crashed into each other and soared upwards. The water sounded like cannons firing. My two sisters and my mother hung onto a branch of the same tree but the branch broke. I saw them taken away by the wind and fall into the swirling water.

a How might this type of flooding differ from the freshwater flooding caused by rivers overflowing their banks? (consider factors such as speed of onset, warning time, hazardous effects,period of inundation)

b What could be done to protect people against the type of flooding described in this account?

Flood Survival and Property Protection

1 Know your local flood history
Ask your local council or State/Territory Emergency Service:
- What the terms major, moderate and minor flooding mean to your area and at what official river height your home becomes isolated or inundated.
- Details of your local flood plan, whether you may need to evacuate and how to get to the nearest safe location

2 Make up an emergency kit
During and after a flood you will need the following:
- A portable radio with fresh batteries.
- Candles and waterproof matches.
- Reasonable stocks of fresh water and tinned food.
- A first aid kit and supplies of essential medication.
- Strong shoes and rubber gloves.
- A waterproof bag for clothing and valuables.
- Your emergency contact numbers.

3 Act on flood warnings
- Listen to your local radio and TV stations for further information.
- Stack your furniture and possessions above likely flood levels, with electrical equipment on top.
- Move garbage, chemicals, poisons and fuel to a high secure place.
- Secure heavy objects that might cause damage.
- Protect/relocate stock and equipment in commercial/industrial premises.
- If on the land move livestock to high ground.
- Check your car and fill it with fuel.

4 If you need to evacuate
You may be advised to evacuate by local authorities, but if you decide to leave the area of your own accord tell the police or State/Territory Emergency Service and your neighbours. Either way you should take these actions:
- Empty freezers and refrigerators.
- Collect and secure your valuables, papers, photo albums and mementos.
- Turn off electricity, gas and water.
- Don't forget your emergency kit.

5 During and after the flood
If you remain in your home or when you return take these precautions:
- Keep your emergency kit safe and dry.
- Do not eat food which has been in contact with flood water and boil all water until supplies have been declared safe.
- Don't use gas or electrical appliances which have been flood-affected, until they have been safety-checked.
- Beware of snakes and spiders which may move to drier areas in your house.
- Avoid wading, even in shallow water as it may be contaminated.
- Check with police for safe routes before driving anywhere and don't enter water without checking depth and current.
- Keep listening to your local radio station and heed all warnings and advice.

adapted from 'Hazards, Disasters and Survival', Natural Disasters Organisation, 1992

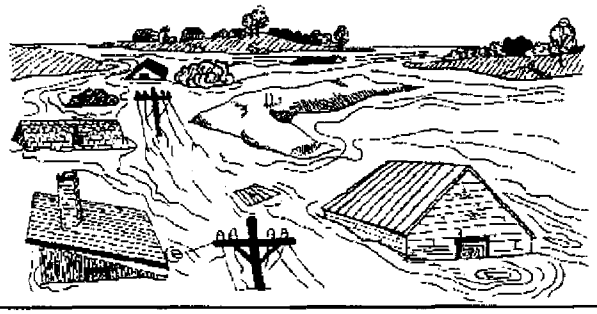
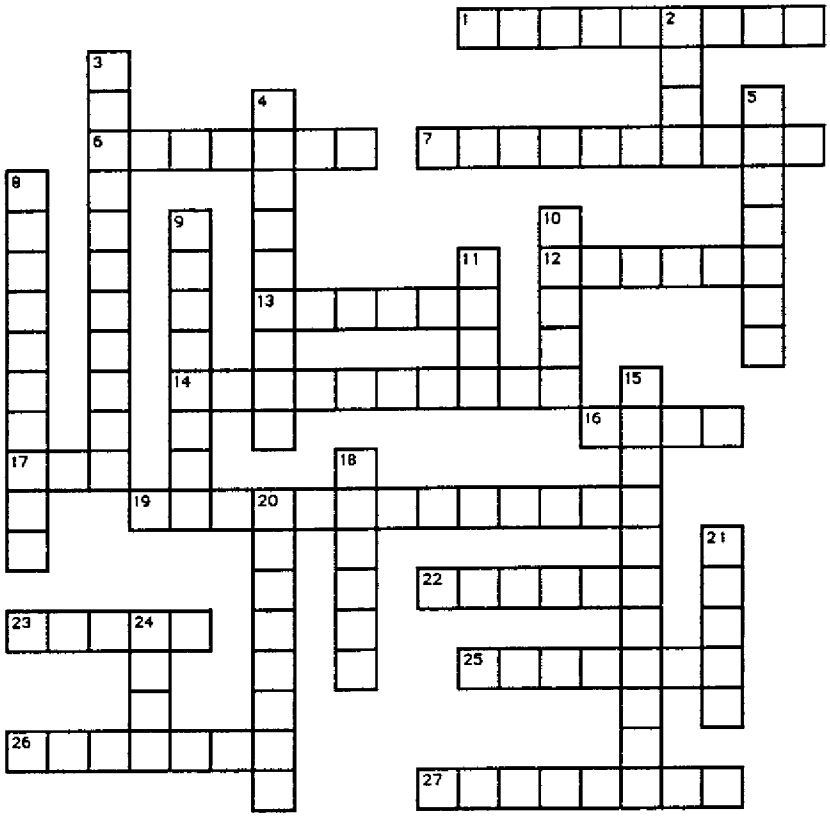


Figure 1: Flood survival and property protection

Activities

1 The informationin Figure 1 outlines steps which should be followed in order to survive a flood and protect property from damage. Study each step carefully.
   a Draw a poster which illustrates one of these steps. (If you are in a large class make sure that all steps are covered equally). As well as containing the necessary information, your poster should be designed to capture people's interest. You may wish to use a range of photographs, drawings or cartoons in order to do this.
   b When you have completed your poster, combine it with others to form a complete set of the five steps. Display each set in an appropriate place, such as your classroom, the school or community library, the town hall or the meeting place for a local emergency service organisation (e.g. the SES, ambulance, fire service).

Crossword: Floods



answers in back of book

Across

1 River ..... can channel floodwaters away from built up areas.
6 Huge ocean wave caused by an earthquake at sea which can cause serious coastal flooding.
7 Emergency movement of people out of a flood-affected area.
12 Banks constructed to hold out floodwaters.
13 Australia's largest river which suffered major flooding in 1956.
14 Flood-prone country in Asia.
16 This famous river once flooded every year, providing valuable silt for Egyptian farmers.
17 Emergency ..... may be sent to places seriously affected by flooding.
19 Australian state which suffered widespread floods in 1990.
22 Flash-flooding is most common in these large centres of population.
23 These transport links may be cut off by floodwaters.
25 The Thames ..... protects London from major floods.
26 Rates of water ..... increase during floods.
27 Flood-..... of buildings will help protect them from damage during a flood.

Down

2 Fine material deposited by rivers.
3 After prolonged, heavy rain the soil becomes .....
4 Flooding is likely if prolonged, heavy rain falls in the ..... of a river.
5 Run-off into rivers is increased by the clearing of .....
8 A plain, bordering a river, over which floodwaters spread.
9 State capital city which experienced a major flood in 1974.
10 This type of flooding occurs very quickly.
11 Australian inland lake which occassionally floods.
15 Major river in the USA which experienced serious flooding in 1993.
18 Water which runs over the ground surface after rain.
20 The amount of ..... carried by a river increases greatly during flooding.
21 ..... surges are whipped up by tropical cyclones and can cause serious coastal flooding.
24 These water storage structures have flood control as a secondary function.