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WEATHER HAZARDS

The following notes, giving advice for public guidance in dealing with some of the most severe weather hazards, were used recently at the Police Training School. They are circulated for information of staff.

Additional copies of the notes may be requested for appropriate distribution outside the Service.

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(J.F. Gabites)
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NEW ZEALAND METEOROLOGICAL SERVICE

WEATHER HAZARDS

By taking suitable precautions, and by taking the right actions at the time, it is possible to reduce the likelihood of harm coming to persons or property from weather hazards.

The following notes on tornadoes, lightning, and cyclonic storms are intended to draw attention to the character of these phenomena and the precautions that may help reduce the harm they do.

TORNADOES

Nature

The tornado is probably the most violent meteorological phenomenon. It consists of a narrow column of rapidly spinning air only a few hundred feet across. Within it wind speeds probably reach 200 or 300 mph, and possibly on occasion 500 mph.

Perhaps one thunderstorm in a thousand breeds a tornado. Out of the dark base of the thunderstorm a funnel cloud descends, looking something like an elephant's trunk reaching for the ground. The air whirling around the funnel cloud emits a frightening roar, and where it touches the ground becomes filled with dust and flying debris.

The tornado moves in company with the thunderstorm, advancing at 10, 20, 30 mph or more. Its life may be only a few minutes. Few last longer than half an hour or travel more than 20 miles.

The trail of destruction is commonly only 10 to 100 yards wide, but along the trail trees are flattened, buildings unroofed, and cars and sheds tossed about. Large hollow structures like hangars or store sheds are particularly vulnerable. Flying timber and roofing iron can become lethal missiles.

Occurrence

About 20 or 25 tornadoes are reported each year in New Zealand, principally from western districts like Taranaki, Westland, and the Waikato. They occur most frequently in the afternoon.

Warnings

There is no likelihood of advance warnings of the formation of tornadoes in New Zealand.

If alert citizens can report sightings of a tornado promptly enough there is a possibility of the local radio station giving its listeners warning a few minutes before the arrival of the tornado. It may be possible also to alert schools, hospitals, ambulances, and the electricity authority (to switch off power from the damaged area).

Precautions

1. If in the open country when you see a tornado funnel cloud approaching, try to move aside from its path. In a car you may even be able to outrun it.
2. If caught in the open without time to escape, lie flat in the nearest depression or ditch.
3. In a residential area, seek shelter in a wooden rather than brick building.
4. In town, stay out of the streets. Seek shelter in solid buildings. In shops or office buildings stay against an inside wall on a lower floor. Keep well away from windows.
5. If you see a tornado but are not in immediate danger yourself, try to report its position and direction of movement to the Police, the NZBC, or local Meteorological Office.

Rescue

Once the tornado has passed there is no further danger. Rescue work can begin immediately. Any live wires will be a hazard.

LIGHTNINGNature

There is usually a concentration of positive electrical charge in the upper frozen portions of a thunder cloud, a negative charge at its base, and positive charge in the ground below. Potential differences can be as much as 100 million volts. When the insulating property of the air breaks down the lightning discharge may pass from cloud to cloud or cloud to ground.

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Occurrence

Most places in Westland, Taranaki, and Northland experience thunderstorms within audible distance (2-3 miles) on 15 to 30 days a year. The frequency in the Southern Alps is probably higher. Most places east of the main ranges experience thunderstorms on only about 3 to 5 days a year.

Precautions

If you are indoors:

1. Stay indoors; do not venture outside unless absolutely necessary.
2. Stay away from open doors or windows, fireplaces, radiators, stoves, metal pipes, sinks, or any electrical equipment like radios, television sets, lamps, or refrigerators.
3. Do not use the telephone in case lightning should strike the lines.

If you are outdoors:

1. Do not work on fences, telephone or power lines, pipe lines, or structural steelwork.
 2. Do not use metal objects like fishing rods or golf clubs.
 3. Do not handle flammable materials in open containers.
 4. Stop tractor work (especially when pulling metal equipment) and dismount.
 5. Get out of the water and off small boats.
 6. Stay inside your car (it offers good protection).
 7. Seek shelter inside buildings; otherwise look for a ditch, gully, or hollow.
 8. If there is no shelter, avoid the highest object in the area. If only isolated trees are nearby it is better to crouch or lie in the open. The safest distance from a tree is about equivalent to its height.
 9. Avoid hill tops, open spaces, wire fences, metal clothes lines, exposed sheds, or electrically-conductive elevated objects.
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10. If you feel the electrical charge (your hair stands on end or your skin tingles), drop to the ground immediately.

Rescue

Persons struck by lightning receive a severe shock, or burns, or both. Artificial respiration can sometimes revive them. Persons struck by lightning carry no electrical charge and can be handled safely.

CYCLONIC STORMS

Nature

A cyclone is a large vortex in which the air is circulating in a clockwise direction (in the southern hemisphere) around the centre of lowest barometric pressure.

For ordinary purposes the terms "cyclone", "depression" or "low" are used interchangeably, although strictly speaking cyclone refers to the wind circulation, and the other terms to the barometric pressure. In New Zealand the term cyclone is not often used unless the circulation is at least moderately intense.

In its fullest development in temperate latitudes a cyclone may be over 1000 miles across, with winds reaching gale force or stronger over quite large areas of it. Rain is commonly widespread over a curved area on the weather map lying to the east and south of the centre. A major cyclone usually takes several days to reach its fullest development, and a further several days to dissipate. During its life it is likely to move generally eastward and southward, but the movement may be quite irregular.

A special kind of cyclone develops only over warm tropical oceans. A tropical cyclone differs in several respects from cyclones of temperate latitudes. It is generally smaller, with a diameter of not more than 200 or 300 miles. Some tropical cyclones with quite violent winds are less than 100 miles across, and because of their small size can not always be detected or tracked across the oceans with the existing weather reporting networks.

A tropical cyclone usually has a fairly symmetrical structure, with a number of rain bands spiralling in towards an "eye-wall" of cloud and rain surrounding a relatively cloud-free "eye". Winds are quite light in the eye, which commonly has a diameter of some 5 to 20 miles. Thus when the eye passes over a place the wind drops suddenly and the sun may shine. The lull may last

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a few minutes or perhaps half an hour, but the wind will resume its full strength again quite abruptly but from a completely different direction.

About half the tropical cyclones in the southwest Pacific move eastwards in their initial stages, and about half westward, but most eventually turn southward into higher latitudes. Some then dissipate, but others expand and transform into typical temperate-latitude cyclones. Their tracks and changes in speed may be quite irregular.

By international convention the term "hurricane" (as used in warnings etc.) is reserved for tropical cyclones with winds of force 12 (i.e. the mean speed, as distinct from gusts or lulls, exceeds 63 knots). Winds of force 12 ("hurricane force") can occur in disturbances other than true hurricanes.

Occurrence

New Zealand may be affected by major cyclonic storms at any time of the year. Those originating in temperate latitudes tend to be more frequent during the winter half year, while those originating as tropical cyclones are usually limited to the period November to April.

Hazards

The main hazards with any cyclone are

1. Violent winds, especially at sea, through narrow straits and around headlands.
2. Heavy and persistent rain. The danger of flooding is increased if the cyclone becomes stationary.
3. A storm surge, i.e. a general rise in sea level in the vicinity, caused partly by the reduction in air pressure and partly the banking up of water by the strong winds. A storm surge of several feet coinciding with a high tide may cause serious inundation. It may in any case alter the normal tidal flows in places like Cook Strait, creating an additional hazard for vessels navigating in thick weather.

Warnings

The best source of warnings for the general public is the series of NZBC national radio broadcasts direct from the National Weather Forecasting Centre in Wellington, supplemented by the 7.30 p.m. television presentation. In an emergency NZBC local radio stations may broadcast additional bulletins.

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The New Zealand Meteorological Service provides warnings for shipping in accordance with the world-wide scheme adopted by the World Meteorological Organization in consultation with international maritime organizations. There are two standard types of warning in general use throughout the world:

1. Gale Warning : for winds of force 8 (gale) or 9 (strong gale), i.e. for winds with mean speeds in the range 34 to 47 knots.
2. Storm Warning : for winds of force 10 (storm), 11 (violent storm) or 12 (hurricane force), i.e. for winds with mean speeds of more than 47 knots.

A third standard warning applicable only in those areas where tropical cyclones occur is

3. Hurricane Warning : for a tropical cyclone with winds of force 12 (hurricane force), or mean speed more than 63 knots.

Besides broadcasting a regular series of weather bulletins for shipping, the New Zealand Meteorological Service broadcasts gale, storm, and (when appropriate) hurricane warnings for both the tropical and New Zealand areas at 6-hourly intervals from ZLX/ZLZ Wellington/Himatangi. These broadcasts are keyed directly from the National Weather Forecasting Centre. The warnings that relate to the New Zealand area are also broadcast by voice by the coast radio stations (Auckland Radio, Wellington Radio, Awarua Radio, and Chatham Islands Radio) on receipt and repeated at scheduled times.

Warnings of flooding are issued by the various local catchment authorities, not the Meteorological Service. Catchment Engineers are the people who best know the behaviour of individual rivers in different circumstances. Furthermore they can supplement general advice on rainfall from the Meteorological Service by information on actual measurements and stream flow from their local observers throughout the catchment. In the parts of the country not covered by Catchment Boards, Commissions, or Valley Authorities, the responsibility for flood warnings is normally carried by a Ministry of Works office.

Precautions

When a vigorous cyclone (depression) is approaching New Zealand

1. Keep track of its progress through the NZBC national broadcasts at 0030*, 0300, 0530, 0630*, 0714, 1230,

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1600, 2100, and 2317* NZST (the broadcasts marked * are usually recordings, but are revised whenever necessary). New information may result in earlier estimates of the storm's position, movement, or intensity being revised.

2. Allow a considerable margin for safety. The storm may change its direction, speed or intensity within a few hours.

If your area is liable to experience storm force winds ("severe gales")

3. Move small boats to safety.
4. Move stock to shelter, and away from low ground liable to be flooded.
5. Check torch and radio batteries; keep vehicles refuelled (petrol pumps will be inoperative if power is interrupted). Check non-perishable foodstuffs (refrigeration may be lost); store drinking water.
6. Store or secure loose boards, rubbish tins, or other objects that could become missiles.
7. Leave low lying areas that may be swept by high tides or storm waves.
8. Board up or protect vulnerable windows.
9. Stay indoors during the height of the storm. Do not be deceived by a temporary lull as the centre passes.
10. Afterwards, avoid loose or dangling wires. Report them to the electricity authority.
11. Report broken sewers or water mains, or undermined roads.
12. Check refrigerated food for spoilage if power has been off.
13. Avoid low ground that may be swept by floods still to come.
14. Monitor the local radio station for flood warnings.

WEATHER FORECASTS AND WARNINGS

The provision of information on present and expected weather conditions is the function of the Weather Forecasting Division of the New Zealand Meteorological Service, under the Assistant Director (Forecasting).

The National Weather Forecasting Centre, Wellington (24-hour service telephone Wellington 70-689; recorded local forecasts 59-977; telegrams "Weather Wellington") provides

Weather Forecasts and Warnings to

General public (via radio and newspapers)
Shipping
Other special interests

Storm Warnings to

Marine Department
Ministry of Works Operations Room
N.Z. Electricity Department
Police Headquarters
Civil Defence Headquarters

Heavy Rainfall Alerts to

Catchment authorities

The following branch forecasting offices concerned primarily with aviation are available to assist with advice to local organizations:

Meteorological Office, Auckland
(24-hour service. Telephone 364-432; recorded local forecasts 364-800).

Meteorological Office, Christchurch
(0700-2100 NZST. Telephone 584-189).

The following observing offices are not able to provide forecasts themselves but will endeavour to obtain information on request:

Kaitaia	(Telephone Awanui 139)
New Plymouth	(Bell Block 729)
Rotorua	(Rotorua 4176-S)
Gisborne	(Gisborne 6139)

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Ohakea	(Palmerston North 81-109)
Paraparaumu	(Paraparaumu 1060)
Nelson	(Nelson 89-799)
Hokitika	(Hokitika 291)
Dunedin	(Henley 779)
Invercargill	(Invercargill 82-486)

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