

4- Climate change and Environmental Management

a- Australian state orders 30,000 people to evacuate due to 'catastrophic' fire risk

Firefighters in Australia are battling a huge blaze that has forced the evacuation of tens of thousands of people amid some of the worst fire conditions the country has seen in recent years. Hot, dry and windy conditions have created "extreme to catastrophic fire dangers" in parts of Victoria and South Australia, according to Australia's Bureau of Meteorology.

Around 30,000 people had been ordered to evacuate parts of Victoria before midday Wednesday, when authorities warned it would be too late to leave.

Temperatures are rapidly rising to the 40°C range (104°F), with wind gusts reaching 60 to 70 kilometers per hour (37 to 43 mph), according to an update from Jason Heffernan, chief officer at Victoria's Country Fire Authority (CFA), the state's volunteer fire service. "Extreme fire dangers are coming to fruition, and in fact we're currently seeing catastrophic conditions in Casterdon, Hamilton and Kanagulk in the Wimmera weather district," he said. "The frontal system making its way through the state has slowed. So, we will see these winds and these temperatures stay around for a bit longer than expected. And I don't expect this change to come through metropolitan Melbourne now until between 9 and even 10 o'clock this evening."

Firefighters have been battling a bushfire that started last Thursday in the rural town of Bayindeen, about 190 kilometers (118 miles) west of Melbourne, and is not yet under control, according to the state's emergency department.

Kathleen Magramo and Morayo Ogunbayo, CNN, Wed February 28, 2024

b- Create your own Bushfire Plan, in 3 easy steps

Would you remember a plan that's just in your head if you're surrounded by smoke, heat and flames?

Making a choice when a bushfire threatens is too late. Your safety and survival during a bushfire will depend on how prepared you are and the decisions you make, and a written plan will take the pressure off you and avoid arguments and delays.

So don't wait - create your 5 Minute Bushfire Plan now for you, your family, and your pets and livestock.

Things to consider when completing your plan

Think about who your plan will protect:

- Me
- Other Adults
- Children
- People who need assistance
- Pets and livestock

Consider what you'll do if:

- You're at work
- The pets run away
- The children are home alone
- You have guests over
- Your escape route is blocked

Discuss key decisions with your household:

- Is everyone going to leave early?
- Where will you go?
- What will you do with your pets?
- What will you take with you?
- Who do you need to keep informed of your movements?

c- Making Every Drop Count: How Australia is Securing its Water Future

Of all earth's continents, only Antarctica gets less precipitation than Australia. Its average annual rainfall of just 470mm is also unevenly distributed: in the Northern Territory, Darwin receives around 1,700mm, while Adelaide in South Australia gets less than one-third of this—some inland towns survive on less than 200mm. Australia's limited and unpredictable rainfall is being exacerbated by climate change with the continent one degree warmer than a hundred years ago and receiving significantly less rain. In 2018, every state except for Tasmania and Western Australia received less than average rainfall while persistent high temperatures in Queensland contributed to record rates of evaporation. From 1996-2010 the Millennium Drought brought long-term water restrictions to the country's highly populated southeast and southwest. It was a catalyst for change. Driven by the twin challenges of declining water supply and growing demand, Australia has stepped up its efforts to secure its water future.

Despite the continent's vast size, nearly the entire population lives in cities. These are predicted to grow by an additional 20 million people in the next 30 years, with water consumption in larger cities expected to rise by 73% to more than 2,650 gegalitres. To meet this demand Australia is looking beyond its traditional rain-fed dams and reservoirs. Instead, it is turning to technology with all the mainland states investing in large desalination plants, each producing up to 674 gegalitres of additional freshwater to cushion city-dwellers against growth and drought. However, desalination is costly and controversial, using so much energy that its water is nicknamed 'bottled electricity'; Sydney's plant costs A\$500,000 a day to run—even standing idle. This January it was switched on for the first time since 2012 and is expected to contribute 15% of the city's drinking water, staving off severe restrictions.

Jon Heggie, *National Geography*, 2018

d- Australia

Due to the huge size of the country, Australia has several different climate zones. The northern section of Australia has a more tropical influenced climate, hot and humid in the summer, and quite warm and dry in the winter, while the southern parts are cooler with mild summers and cool, sometimes rainy winters.

The seasons are the opposite of those in the Northern Hemisphere-when it's summer in the north, it's winter south of the equator. December and January are the hottest months in Australia, July and August the coldest.

The southern areas of the Australian Continent are generally more temperate to warm, with summer daytime temperatures usually between 25 and 30°C and winter temperatures between 5 and 10°C. The Tasmanian mountains and the "Australian Alps" in the southeast of Australia have a typical mountain climate; the winter can be very harsh there, and the highest peaks are usually covered by snow year-round.

Another extreme, but completely different are the conditions in the desert and bush ("outback") areas in central Australia; the temperature reaches sometimes 50°C and more, and rain may not fall for years. Most rain falls in the northeastern coastal parts of Australia (Darwin), with an annual average of 100 inches and more. Sometimes tropical cyclones can occur in the northern coastal areas, causing heavy wind and rainstorms; these storms usually occur in the Southern summer months between November and April. Extratropical storms can occur in the southern coastal areas during this time.

Required clothing:

Northern Australia: Lightweight (cotton) clothing in the summer months, with a raincoat for local showers/cloudbursts, warmer (waterproof) clothing with a sweater for the winter months. Southern Australia: lightweight waterproof clothing with a sweater for cool evenings; Mediumweight clothing is advised for the winter months. Warmer clothing is needed in the Tasmanian mountains; be prepared for extreme temperatures when you travel in the inland areas ("outback") of Australia.

e- How rising sea levels will affect our coastal cities and towns

Even a small rise in sea level can have big impacts on coastal properties, so we must do all we can to limit the changes while taking them into account in coastal land-use planning. Global sea levels are rising for two main reasons: the oceans are getting warmer, and land-based ice sheets and glaciers are melting. As ocean water warms, it expands. Because the ocean basins are finite (like a bathtub), this results in a rise in water levels.

Since the 1970s, thermal expansion of the oceans has accounted for roughly half of measured global sea-level rise. The other half is due to land-based ice melt from ice sheets and glaciers. Together, these make up what is known as “eustatic” sea level. The rate of sea-level rise experienced at the coast also depends on whether the land is moving up or down. “Relative” or “isostatic” sea level is the sum of “eustatic” sea level plus local vertical land movement.

Australia is rising by about 0.3-0.4 millimetres a year due to glacial isostatic adjustment. This is the result of the land continuing to move upward following the loss of ice on land during previous glaciations. The land subsided under the weight of this ice and is now rebounding as the ice is gone. This slow rebound of the land provides a small offset to eustatic sea levels around Australia.

Even if greenhouse gas emissions reached zero tomorrow, sea levels will continue to rise for several centuries because of the slow response of the ocean to warming. It’s a long-term trend that we must live with. This is why it is important to factor in sea-level rise when we make planning decisions along the coast. Unfortunately, the rate of sea-level rise over the coming century remains highly uncertain, making it difficult to include in coastal planning.

Thomas Mortlock, *UNSW Sydney*, 18 Jan 2024

f- How are sea levels changing?

In past warmer climates, sea level was higher than today. Sea level was between 5 metres and 10 metres above current levels during the last interglacial period (129,000 to 116,000 years ago) when global average surface temperatures were less than 2°C above their values just before the start of the industrial era in the 19th century.

Globally, sea levels are currently rising. For two thousand years before the mid-19th century, the long-term global sea-level change was small, only a few centimetres per century. Since then, the rate of rise has increased substantially; from 1900 to 2012, sea level rose by a global average of about 19 centimetres. In the past 20 years, both satellite and coastal sea-level data indicate that the rate of rise has increased to about 3 centimetres per decade.

Around the Australian coastline, sea level rose relative to the land throughout the 20th century, with a faster rate since 1993.

Rising sea levels result in a greater coastal flood and erosion risk Rising average sea levels mean that extreme sea levels of a particular height are exceeded more often during storm surges.

Sea levels will continue to rise for centuries By 2300, it is projected that high greenhouse gas emissions could lead to a global sea-level rise of 1 metre to 3 metres or more. This may be an underestimate because it is difficult to accurately simulate the changes in the discharge from the Antarctic and Greenland ice sheets. Sustained warming would lead to the near-complete loss of the Greenland ice sheet over a thousand years or more, contributing up to about 7 metres to global average sea-level rise. Current understanding is insufficient to assess the timing or magnitude of such a multi-century contribution from Antarctica, although there is increasing evidence that it may already have commenced.

Robert Montgomery, Australian Academy of Science, 2013

g-Coral bleaching

When corals are under stress, they expel the microscopic algae that live in their tissues. Without these algae, corals' tissues become transparent, exposing their white skeleton. This is called coral bleaching. Bleached corals are not dead, but are more at risk of starvation and disease. Rising ocean temperatures caused by climate change is the primary cause of coral bleaching. A temperature increase of just one degree Celsius for only four weeks can trigger bleaching. Changes in water quality, increased sun exposure and extreme low tides can also cause corals to bleach. The past two decades have seen several widespread coral bleaching events on our Great Barrier Reef, with four mass bleaching events in the last seven years.

The summer of 1997-1998 was one of the hottest recorded on the Reef in the 20th century. Mild bleaching was observed in late January and intensified in February and March. Most reefs recovered fully with less than 5% of inshore reefs suffering high coral mortality, however the most severely affected reefs in the Palm Island area saw up to 70% of corals die.

A bleaching event largely confined to the southern part of the Reef, particularly around the Keppel Islands, took place in January and February 2006. The degree of bleaching was worse than in previous years, with up to 98% of corals bleached on some reefs.

The Reef experienced unprecedented back-to-back (2016 and 2017) bleaching, collectively affecting two-thirds of the Great Barrier Reef. The central third of the Great Barrier Reef was severely affected in early 2017, due to unusually warm sea surface temperature and accumulated heat stress. The southern sector was spared both years.

In 2020, widespread severe bleaching was detected across many regions of the Great Barrier Reef. Of the 1,036 reefs surveyed from the air, 60% suffered moderate or severe bleaching. On-water monitoring capabilities were restricted due to the Covid-19 pandemic, so limited data on coral mortality was collected.

Coral bleaching was observed along the length of the Reef, with the Northern and Central regions experiencing extreme bleaching in 2022. In the South, bleaching was mostly minor. This mass bleaching event was particularly concerning because it occurred during a La Niña summer, which typically brings cooler, wetter conditions.

Great Barrier Reef Foundation, April 2024

h- Fifth mass coral bleaching event in eight years hits Great Barrier Reef, marine park authority confirms

Particular concern raised for southern areas of the reef that have not been badly bleached since 2016 with 'high risk' of significant coral death

Researchers and scientists told Guardian Australia they were devastated by the bleaching, particularly in the reef's southern section where corals hundreds of years old were severely bleached.

Dr Roger Beeden, the chief scientist at the Great Barrier Reef Marine Park Authority, said: "We now have widespread, often called mass, coral bleaching across the surveyed reefs."

He said the bleaching was being driven by global heating and an El Niño climate pattern. In-water surveys were ongoing to understand the severity of the bleaching, he said, and in the past the reef had shown resilience.

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Graham Readfearn, The Guardian, February 2024