

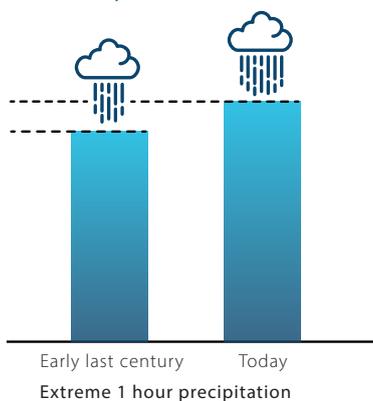
‘Rainfall extremes are getting more extreme’ – are they?

Victoria is warming and even though the amount of rain falling over the whole year is likely to decrease; some extreme rainfall events are getting more extreme—but what exactly does that mean?

Extreme weather events are those events that are rare for a particular place and time of year. As Australia warms we are finding that the characteristics of those rare events are changing.

In Victoria, our physical understanding and climate models tell us with a high degree of confidence that the intensity of rare rainfall events is likely to increase over time (Figure 1). We have already seen increases, but not everywhere and not all the time.

Figure 1: Likely change in hourly heavy summer rainfall compared to early last century.



In cities and towns where the hard surfaces mean that the water can't be absorbed into the ground, the rain fills up gutters and stormwater drains. As you can imagine more extremes have significant implications, particularly for urban planning.

Extreme rainfall can also cause flooding in rural areas, particularly if it has already been raining heavily on many days or weeks beforehand. However, if the conditions have been dry, all but the most extreme rainfall may simply be absorbed into the landscape and not lead to flooding.

Examples of extreme rainfall in Victoria

- » In late December 2016, Viewbank received 40mm in 15 minutes and Bundoora had its highest December daily rainfall on record – over 100mm. This caused flash flooding and creeks broke their banks. There was extensive storm and water damage and disruptions to road and rail travel.
- » In December 2018, a month's worth of rain fell in less than 24 hours resulting in at least 100 cars trapped by flash floods on the Hume Freeway north of Wangaratta.



Photo Credit: Catherine Ganter



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Why does this matter?

We need to know how intense and frequent rainfall events are now and how they are likely to change in the future, so that we can better prepare and respond.

For example, if rainfall events become heavier and/or more frequent, civil engineers may need to design stormwater infrastructure to prepare for this. Or, if we already know that heavy rains can disrupt a city's or region's transport system, then transport planners and emergency response organisations need to be prepared for this happening more often.

Building our understanding

We need a long period of observations so that we can identify trends in extreme rainfall events, because extreme events are, by definition, rarer in the data.

We can also draw on our understanding of the way weather works. We have a good understanding of the physical processes of the atmosphere—in particular, the effects of increased temperature. The warmer the atmosphere, the more water vapour it can hold before it finally condenses and falls as rain.

Based on our understanding of these processes, the intensity of extreme rainfall should increase by at least 7% for each degree of warming. Observations show an average increase of 14% per degree of warming. This difference is because the processes that produce rainfall are highly complex. Research is underway to better understand these processes.

Observations of the atmosphere help us understand the rain-bearing weather systems that bring intense rainfall and how they are changing. Climate models simulate large-scale atmospheric processes and provide information about how those features are changing.

The more our knowledge grows the better equipped we are to adapt to extreme rainfall events as the climate warms. New research under the Victorian Water and Climate Initiative is expected to shed more light on how Victoria's extreme rainfall is changing.

How is Victoria's extreme rainfall changing?

Well....It's complicated! Exactly what changes are happening depends on the duration, place, season, and the type of weather system bringing the rain.

- » **Duration:** Heavy rainfall events that last a short time (e.g. less than 1 hour) are expected to increase in intensity the most.
- » **Season:** Storms in summer are expected to become more intense. Storms in autumn and winter might see little change.
- » **Rare events:** Expect rarer heavy rainfall events to become more intense and more frequent.
- » **Location:** Depending on the season and place, the rate of increase in rainfall intensity for different types of weather systems for example, a cold front compared to an afternoon thunderstorm—might differ. The trends may differ also.

The intensity of rainfall: Is the amount of rainfall that falls over a given time period. We measure that in millimetres, measured over an hour, or a day, or month. It could range from less than 1.0 mm in an hour to almost 100 mm, depending on where you are.



Photo: A tipping bucket rain gauge, data logger and funnel (instrument) / photograph by Mike Rosel. Copyright Commonwealth of Australia.

Updates on the Victorian Water and Climate Initiative are available on our website: www.water.vic.gov.au/climate-change/climate-and-water-resources-research/the-victorian-water-and-climate-initiative or subscribe to our newsletter by emailing: HCS.Team@delwp.vic.gov.au

This fact sheet has been prepared primarily by the Bureau of Meteorology, through the Victorian Water and Climate Initiative.

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