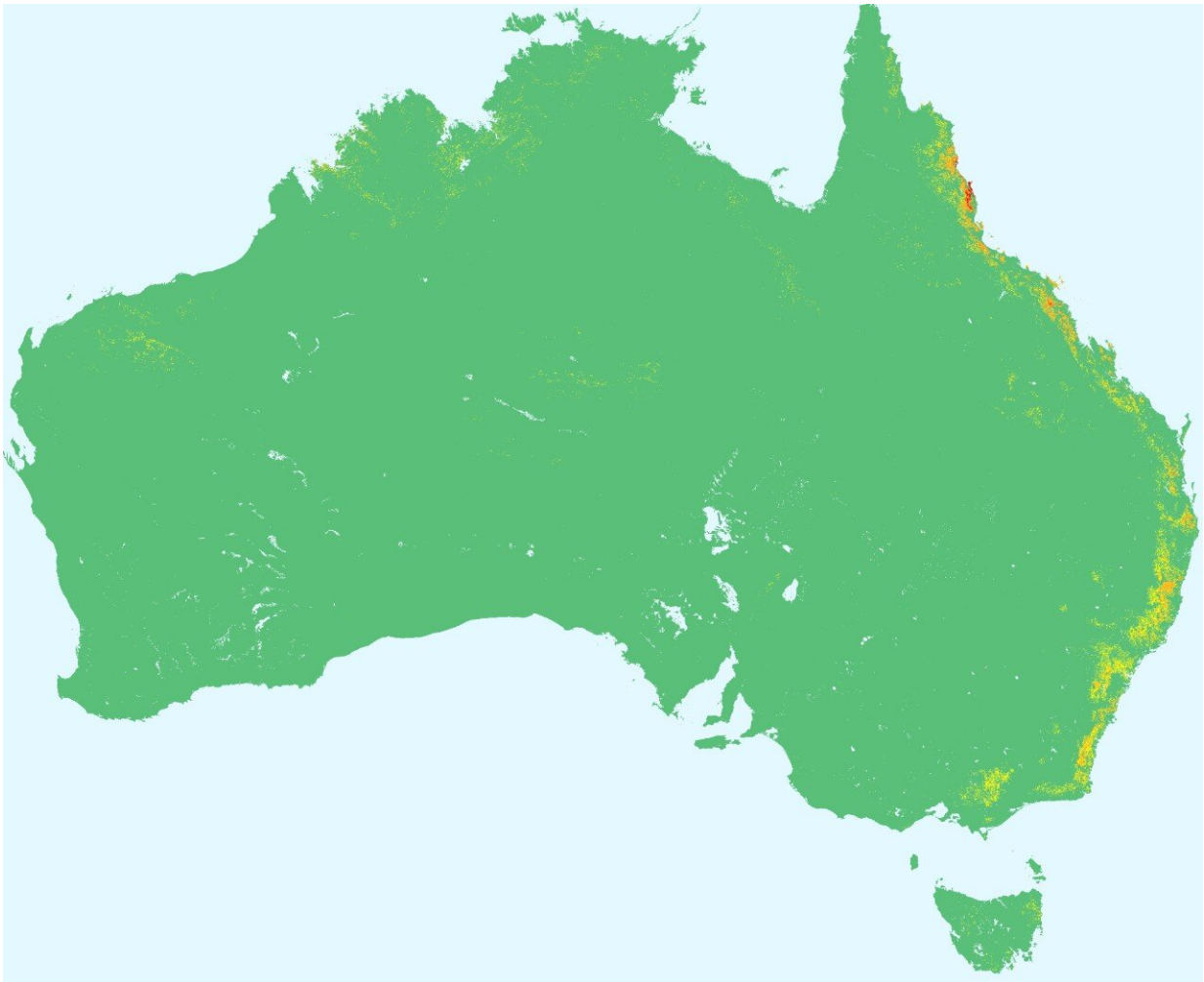


Experts explain the effect of climate change on infrastructure

November 27 2019, by Luisa Low



Dr Mark's map depicts projected landfall hazard in 2050. Blue is water, green is safe (low risk), yellow is medium risk, red is high risk. Credit: University of Sydney

From fires in the Amazon and in Australia, to flash flooding in Europe, right across the globe we are witnessing the impact of climate change on the environment. But how does a changing climate affect key infrastructure? Engineering experts explain.

How does climate change affect transport infrastructure?

School of Civil Engineering academic, Professor David Levinson is a transport engineering expert who says [transport infrastructure](#) both contributes to [climate change](#), but can also be affected by it.

"The issue goes two ways in transport. Typically, road and air transport are considered major contributors to climate change, making up 23 percent of CO₂ emissions," said Professor Levinson.

"But transport is also vulnerable, particularly due to so many facilities like roads and bus terminals being in flood zones, for instance New Jersey Transit lost \$US120 million in damage to buses after Hurricane Sandy.

"Many transport facilities are also below grade, tunnels like those in the New York Subway were severely damaged from flooding during Sandy. Airports being at low elevations along the coast are at risk of sea-level rise. Extreme heat can cause road buckling, freeze-thaw cycles cause pavement cracking and potholes.

"Extreme weather increases the variability of weather, and roads designed for a particular climate range may fail more quickly. All of these add costs to design and retrofit, as well as decreasing reliability for users."

The impact on water networks

Professor Marjorie Valix from the School of Chemical and Biomolecular Engineering says that there are several ways water carrying infrastructure can be impacted.

"Climate change can impact our water-carrying infrastructure in four key ways, through both increased and decreased precipitation, higher sea levels and higher temperatures," said Professor Valix.

"Each scenario places significant stress on our water network assets. Increased precipitation can lead to infrastructure damage and soil runoff; decreased precipitation can lead to increased water pollution due to a drop in water flows; increased air and water temperatures lead to more rapid evaporation and asset corrosion; and a sea level rise could affect both the availability and quality of water supply due to saltwater intrusion into groundwater aquifers and distribution networks.

"What we are currently witnessing is a dramatic drop in rainfall. Recent studies indicate that rainfall will continue to decrease in Australia's urban centers, making us more reliant on desalination, which is costly. A decrease in rainfall can also increase the cost of infrastructure, with higher maintenance and repair costs for water treatment systems due to lower quality inputs."

Bridges to be bolstered to survive climate change

Expert in [bridge engineering](#) who recently joined the School of Civil Engineering as a Professor of Practice, Professor Wije 'Ari' Ariyaratne, says [bridge](#) infrastructure must be strengthened to prepare for increasing climate change-induced stressors.

"Roads bind communities together and bridges are a vital link of the road infrastructure. There are around 53,000 road bridges in Australia with an estimated replacement value of approximately \$200 billion," said Professor Ariyaratne.

"Bridges start to deteriorate as soon as they are opened to traffic but are generally designed for a service life of over 100 years. Evidence has shown that with proper maintenance most of the existing bridges are performing well without compromising their safety.

"Climate change may have multidimensional adverse impacts on the safety, performance and longevity of existing bridges and in the extreme cases could even result in loss of some bridges due to extreme temperatures, higher flood levels and velocities and bush fires.

"New bridges can be designed and built to sustain climate change by following new codes. The challenge for the engineers today is to develop new techniques for assessing the existing bridges for climatic change effects and come up with cost effective methods for increasing their performance and sustainability."

Will a changing climate cause more landslides?

Dr. Benjy Marks is a lecturer in geomechanics from the School of Civil Engineering who is mapping areas at-risk of land slides in Australia.

"Climate change is having a wide variety of effects on the Australian landscape, in particular, changing rainfall patterns. We expect in the future to see increased drought in some areas, and increased rainfall and tropical storms in others," said Dr. Marks.

"Many areas of Australia, especially those along the Great Dividing Range, are prone to landslides. These catastrophic events are typically

triggered by either intense rainfall or human activity. Climate change is altering the pattern of both of these causes, and there is a pressing need to predict how and where Australians may be impacted by landslides in the future.

"In my research team we are studying the effects of these changes and have recently produced an Australia-wide map of the expected changes in landslide hazard due to [climate](#) change. These maps will be useful to councils, engineers and local residents in making assessments of the landslide risk in their local area, and how this risk may increase in the future."

Provided by University of Sydney

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