

# CLIMATE COUNCIL BRIEFING STATEMENT: DAMAGE FROM CYCLONE PAM WAS EXACERBATED BY CLIMATE CHANGE



The Climate Council is an independent, crowd-funded organisation providing quality information on climate change to the Australian public.

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## Climate Council Briefing Statement

### Damage from Cyclone Pam was Exacerbated by Climate Change.

Cyclone Pam, a category-5 storm with wind gusts reaching 300 km/h, struck Vanuatu on 13 March 2015 leaving twenty-four people dead, 100,000 people homeless and up to 70% of the nation's 69,000 households damaged. The death toll could rise as communications are restored with outlying islands. Cyclone Pam also caused significant damage to some of Vanuatu's low-lying neighbours. Half of Tuvalu's population has been displaced, while the Solomon Islands and several islands around Kiribati were affected by the huge storm.

The massive size of the storm has prompted many in the public and the media to ask the Climate Council about the influence of climate change on extreme weather events such as tropical cyclones, and the vulnerability of and impacts on Pacific communities.

#### Key findings:

1. The damage caused by Cyclone Pam through widespread flooding was exacerbated by climate change. Climate change is here with us today, raising the level of the ocean and increasing the devastation caused by tropical cyclones.
2. Australia's Pacific Island neighbours are particularly vulnerable to climate change. Sea level rise, coastal inundation, ocean acidification and other impacts affect people's health, as well as critical industries like fishing and tourism.
3. The accelerating risks of climate change require that communities prepare for more severe extreme weather now, as well as tackling the cause of the problem by rapidly reducing fossil fuel emissions.

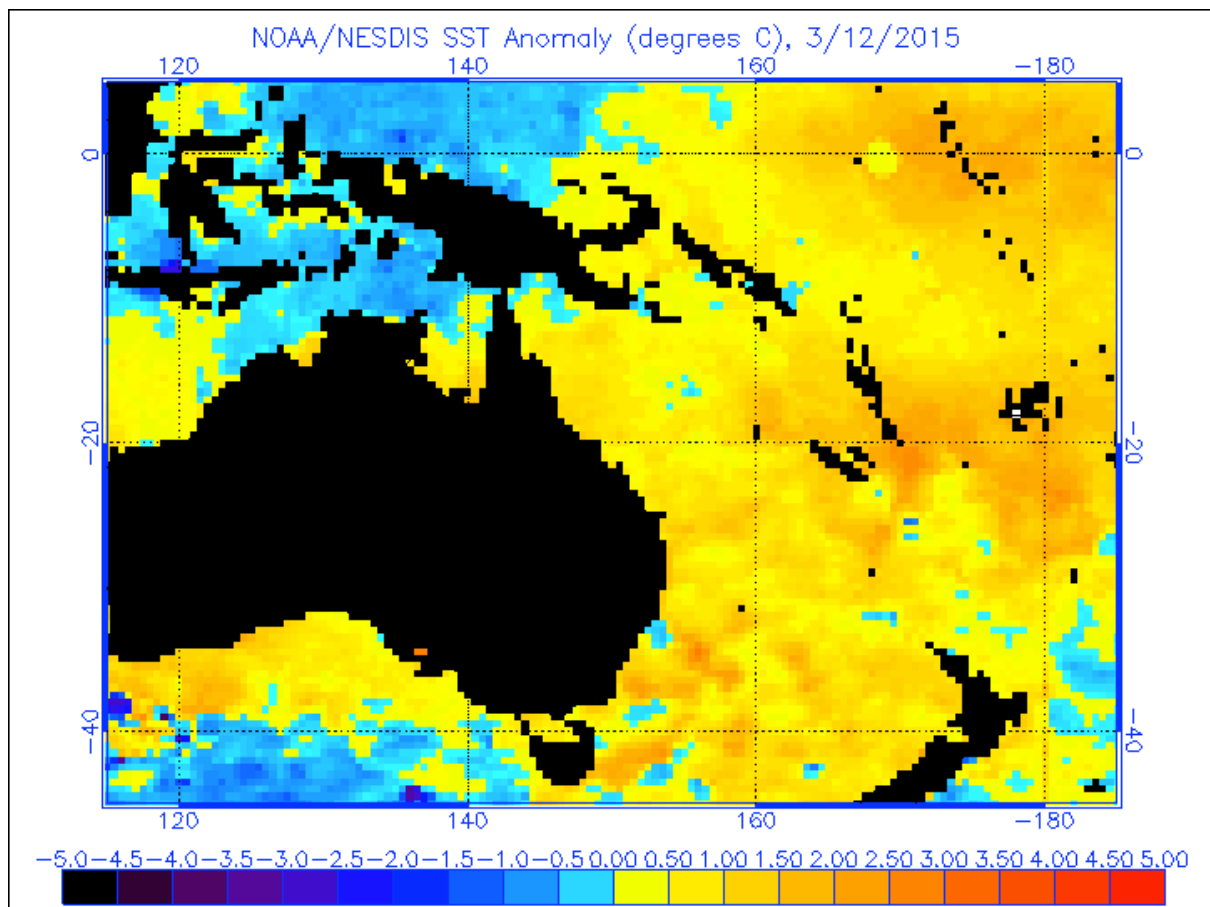
#### What is the influence of climate change on the impacts of tropical cyclones?

The most direct influence of climate change on the impacts of tropical cyclones is via coastal flooding. Typically the damage from tropical cyclones comes from (i) the excessively high winds that directly damage built infrastructure and the natural environment, and (ii) the extensive flooding of coastal regions that occurs from the storm surge that a tropical cyclone drives and the heavy rainfall that often accompanies the storm.

The rise of sea levels globally because of climate change – due to warming oceans and melting ice sheets - means that storm surges are now riding on higher levels than they were earlier, increasing the extent and severity of flooding damage from cyclones and other weather systems than can drive storm surges. Global sea level has already risen by about 20 cm since the mid-19<sup>th</sup> century and continues to rise, with a projected additional rise of from 40 cm to nearly a metre by 2100 compared to 1990s levels.

The increasing temperature of the surface of the ocean affects the intensity of cyclones because the storms draw energy from the surface waters of the ocean. This can increase wind speed and trigger more intense rainfall. The sea surface temperature in cyclone Pam's trajectory was well above average (Figure 1).

**Figure 1: Sea Surface Temperature Anomaly over the Western Pacific Region, 12 March 2015.**



In general, tropical cyclones are projected to become more intense but less frequent. However, the influence of climate change so far on the nature of tropical cyclones themselves is less well known, in part due to limited and inconsistent datasets of cyclone behaviour over the past several decades.

### **What is a storm surge?**

A storm surge is a rise above the normal sea level resulting from strong onshore winds and/or reduced atmospheric pressure. Storm surges, which accompany tropical cyclones, can cause extensive flooding of coastal areas. The area of sea water flooding may extend along the coast for hundreds of kilometres, with water pushing several kilometres inland if the land is low-lying. The worst impacts of a storm surge occur when it coincides with a particularly high tide.

### **How is climate change influencing sea level?**

Climate change drives up sea level by warming the oceans and increasing the flow of ice from the land into the sea, for instance from melting glaciers and polar ice sheets. The most immediate and serious consequence of rising sea level is the flooding of coastal areas through both inundation and land recession. Climate change exacerbates coastal flooding from a storm surge as the storm rides on higher sea levels.

### **What are the impacts of tropical cyclones on Pacific Islands?**

Climate-related disasters now account for over 80% of all disaster events globally and contribute enormously to economic losses and short and long-term population displacement triggered by disaster events. Across the world 155 million people have suffered short or long-term displacement since 2008.

The Pacific region has suffered its share of climate-related disasters. Super Typhoon Haiyan is the strongest tropical cyclone to make landfall in world history, spanning over 600 km with winds of 315km/h and gusts up to 380km/h, accompanied by a substantial storm surge reaching up to 5.2 meters in Tacloban. It left in its wake thousands dead and millions displaced. Cyclone Pam is the most recent reminder that cyclones produce devastating winds, heavy rainfall and storm surges that can create chaos for low-lying coastal areas. This storm followed recent cyclones that have affected Pacific Island countries, such as Sandra in November 2012, which caused 16 deaths and over \$160 million in damages and in December 2012, Cyclone Evan which left scores of dead with damages estimated at over US\$ 300 million.

Many Pacific island communities are extremely low-lying and are therefore among the most vulnerable to the impacts of climate change, particularly from sea-level rise and storm surges. Coastal flooding, for example, creates many risks, including impacts on health and well-being, damage to coastal ecosystems and disruption of people's lives. Annual damage and protection costs from coastal flooding are projected to amount to several percentages of the national GDP for countries such as Kiribati, the Solomon Islands, Vanuatu and Tuvalu under sea-level rise projections of 0.6–1.3 m by 2100. In some countries, particularly developing countries, coastal defences are not fully effective for the current flooding risk, resulting in an 'adaptation deficit'. The costs of eliminating this deficit could be very high.

Coastal flooding is a sleeping giant. If the threat of sea-level rise is ignored, the projected increases in economic damage caused by coastal flooding are massive. By 2050—without adaptation—the losses from coastal flooding globally are projected to rise to \$US1 trillion per year, approaching the size of the entire Australian economy. By 2100 the losses from coastal flooding are projected to be 0.3–9.3% of global GDP per year. The high-end projection is a scenario for global economic collapse.

## What can we do?

We need deep and urgent cuts in greenhouse gas emissions this decade and beyond if we are to avoid the most serious risks from rising sea levels, coastal flooding and cyclones. To prepare for the sea-level rise that we can't prevent, and the impacts associated with storm surges on the back of tropical cyclones, it is essential to lower the risks of coastal flooding. This requires a coordinated planning framework integrated across Pacific Island nations that are often in the path of cyclones, as well as coordination with countries, such as Australia and New Zealand, contributing long-term aid as well as short-term emergency management support.

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## Supporting the Cyclone Pam Relief Effort<sup>1</sup>

Below is a list of some of the organisations involved in providing humanitarian relief in the aftermath of Cyclone Pam that are accepting donations.

- **The Australian Red Cross:** Cyclone Pam (Vanuatu) 2015 Appeal: <http://www.redcross.org.au/cyclone-pam-vanuatu-2015-appeal.aspx>
- **Oxfam Australia:** Cyclone Pam Fund: <https://www.oxfam.org.au/my/donate/cyclone-pam-in-vanuatu/>
- **Unicef Australia:** Cyclone Pam appeal: <https://secured.unicef.org.au/Appeal/cyclone-pam-appeal>
- **CARE Australia:** Cyclone Pam emergency relief: <https://www.care.org.au/appeals/cyclone-pam/>
- **ChildFund Australia:** Emergency Response Vanuatu: <http://www.childfund.org.au/appeal/emergency-response-vanuatu>
- **Save the Children Australia:** Cyclone Pam emergency response: [https://www.savethechildren.org.au/donate/make-a-donation?undefined=donate+now&donation=20&amount=&for=Emergency+Relief&emergencyTitle=Cyclone+Pam+Emergency+Response&donateFor=Cyclone+Pam&sp\\_name=Cyclone+Pam&sp\\_url=http%3A%2F%2Fwww.savethechildren.org.au%2Four-work%2Fcurrent-emergencies%2Fcyclone-pam](https://www.savethechildren.org.au/donate/make-a-donation?undefined=donate+now&donation=20&amount=&for=Emergency+Relief&emergencyTitle=Cyclone+Pam+Emergency+Response&donateFor=Cyclone+Pam&sp_name=Cyclone+Pam&sp_url=http%3A%2F%2Fwww.savethechildren.org.au%2Four-work%2Fcurrent-emergencies%2Fcyclone-pam)
- **World Vision:** emergency response to Cyclone Pam: <https://emergencies.worldvision.com.au/#/donate/cyclone-pam>
- **Uniting World:** emergency relief fund: <http://www.unitingworld.org.au/cyclone-pam/>
- **Act for Peace:** Vanuatu cyclone emergency appeal: [http://www.actforpeace.org.au/Get-Involved/Our-latest-appeals/Vanuatu-Cyclone-Emergency-Appeal?utm\\_source=afp-website&utm\\_medium=homebanner&utm\\_campaign=web-popup-mar15-tcpam](http://www.actforpeace.org.au/Get-Involved/Our-latest-appeals/Vanuatu-Cyclone-Emergency-Appeal?utm_source=afp-website&utm_medium=homebanner&utm_campaign=web-popup-mar15-tcpam)
- **Plan International Australia:** Cyclone Pam: <http://www.plan.org.au/Donations/Donate/Help-Children-in-Crisis.aspx>
- **Vanuatu High Commission, Australian Friends of Vanuatu and Vanuatu Government Relief Fund:** <https://chuffed.org/project/vanuatu-heart-blong-mi-stap-wid-yu>

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<sup>1</sup> Disclaimer:

The Climate Council is a registered charity with the ACNC. We do not have an affiliation with other charities that support victims of Cyclone Pam. However we do encourage anyone who wants to donate to Cyclone Pam to give to an established Humanitarian charity.

You can use the ACNC Charity register to find those charities and contact them directly using the details listed on the Register. People that want to donate to the Cyclone Pam relief effort can check the legitimacy of a charity by accessing the Charity Register at [www.acnc.gov.au/findacharity](http://www.acnc.gov.au/findacharity)