

PACIFIC DATAVIZ CHALLENGE 2026 · THEME IS CLIMATE CHANGE

Papua New Guinea's Coast Is Being Lost to the Sea

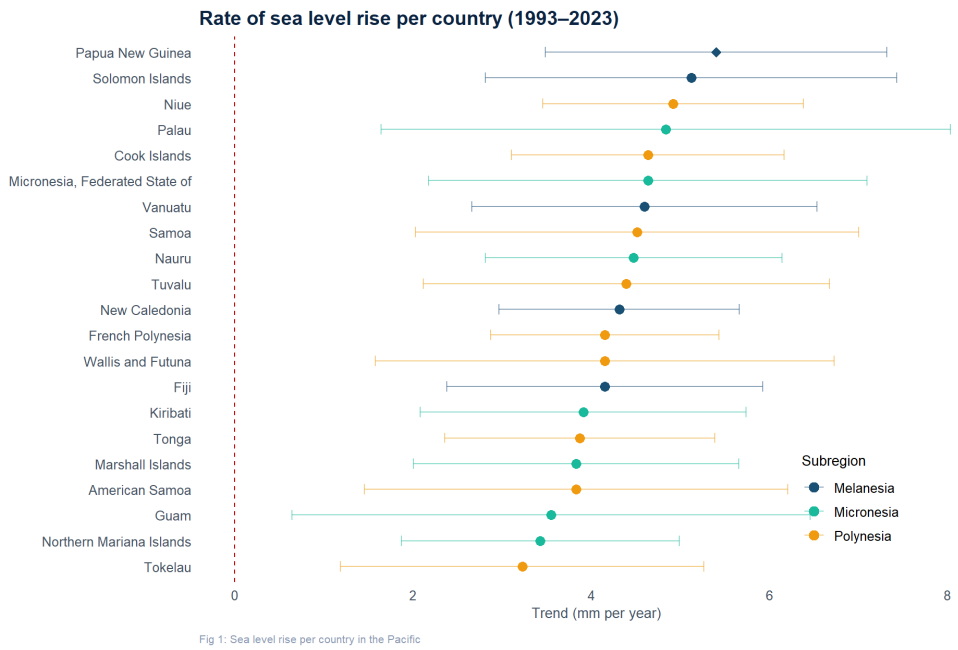
Of all 21 Pacific Island nations, PNG records the fastest rate of sea level rise — and the trend shows no sign of slowing

The SPC Pacific Data Hub tracks sea level measurements across 21 Pacific Island nations and territories dating back to 1993. One finding stands out: Papua New Guinea sits at the top of every ranked chart in this dataset. Its sea levels are rising at **5.4 mm per year** — faster than any other Pacific nation on record. This report examines that finding: what the data shows, how PNG compares across the Pacific, and what it means alongside warming temperatures and growing disaster costs.

PNG leads a ranking no nation wants to top

THE KEY FINDING

A linear trend model fitted to each country's 30-year record places PNG at the head of the table. The estimate of 5.4 mm/yr (95% CI: 3.5–7.3 mm/yr) is statistically significant and sits clear of the next-fastest nations.



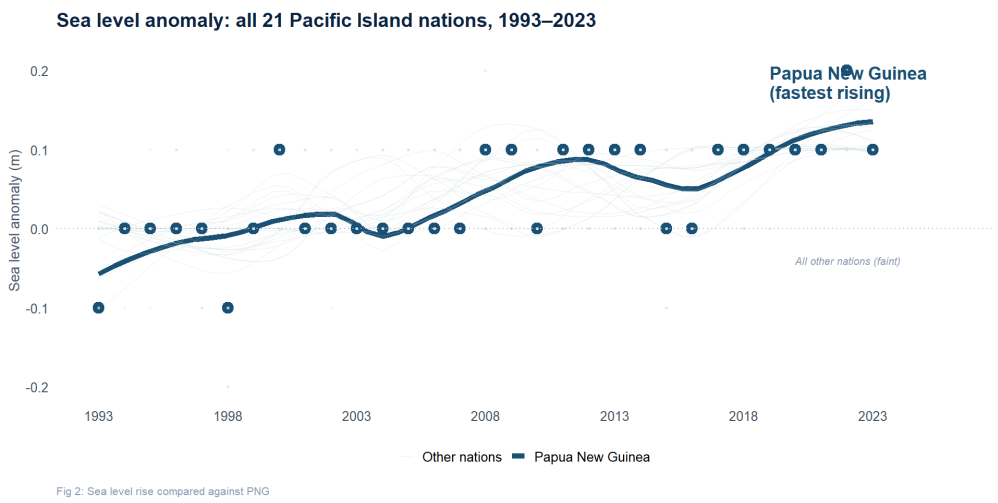
Every confidence interval in this chart lies entirely above zero. No country shows a flat or declining trend — the rise is universal. But PNG's rate is the highest, and it matters: a nation rising at 5.4 mm/yr faces a meaningfully different trajectory from one rising at 3.2 mm/yr (Tokelau, at the bottom of this chart).

PNG has 67% faster sea level rise than the slowest Pacific nation in this dataset. With roughly 9 million people and thousands of kilometres of coastline, that differential has direct implications for coastal infrastructure, agriculture, and communities.

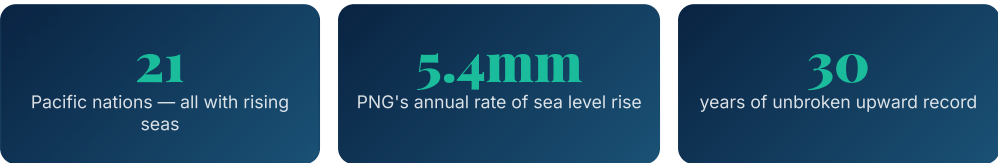
PNG is not alone — but it leads

THE PACIFIC-WIDE PICTURE

PNG's position at the top does not mean the rest of the Pacific is safe. All 21 nations show the same upward direction over the full period. The chart below shows every country's trajectory, with PNG highlighted.



The grey lines collectively confirm that PNG's trend is the steepest — but they also show that the trajectory is shared. Tuvalu, Kiribati, Marshall Islands, and every other Pacific nation are tracking in the same direction.



PNG also sits geographically at the western edge of the Pacific, where sea levels are most directly influenced by the Walker Circulation and western Pacific warm pool dynamics — factors that may partly explain its elevated rate compared to the central and eastern Pacific nations.

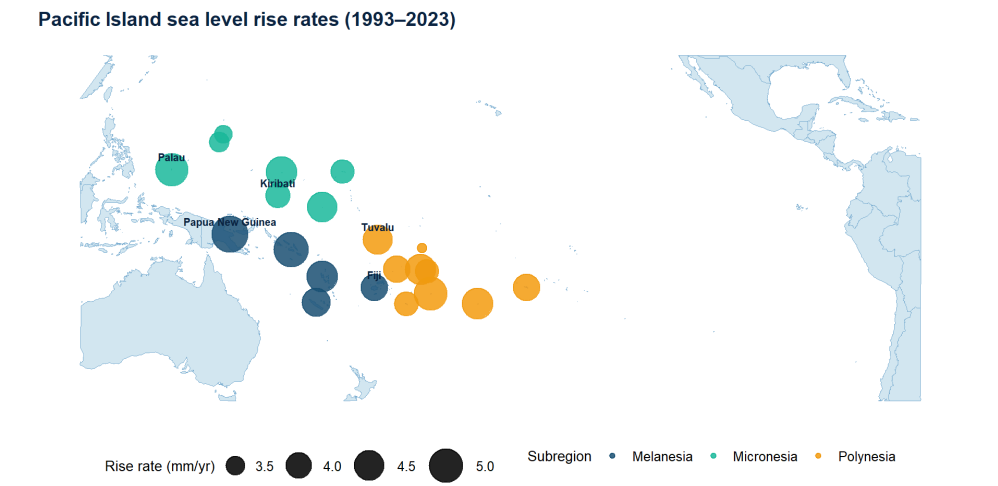


Fig 3: Map of the Pacific island countries by sub region

Subregion comparison

WHERE MELANESIA STANDS

PNG belongs to Melanesia, which as a subregion records the highest mean rate of rise. The table below compares all three subregions.

Sea level rise by subregion		
All rates statistically significant at $p < 0.001$		
Subregion	Rise rate (mm/yr)	95% confidence interval
Melanesia	4.72	3.92 – 5.52 mm/yr
Micronesia	4.10	3.28 – 4.91 mm/yr
Polynesia	4.19	3.56 – 4.82 mm/yr

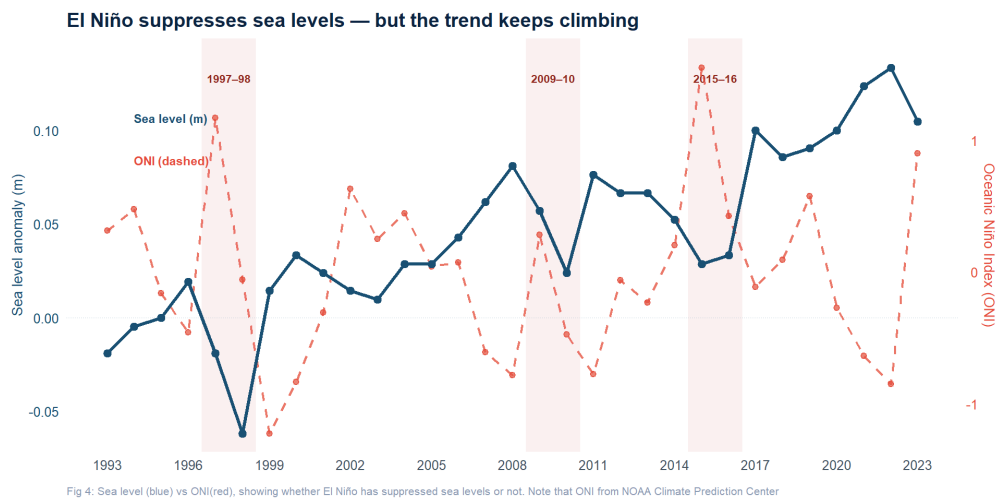
Melanesia's rate is marginally higher than Micronesia and Polynesia, but the confidence intervals overlap considerably. PNG's rate exceeds its own subregion's average — it is not simply carrying Melanesia up; it genuinely stands apart within the region.

Not even El Niño is holding the rise back

THE ENSO SIGNAL

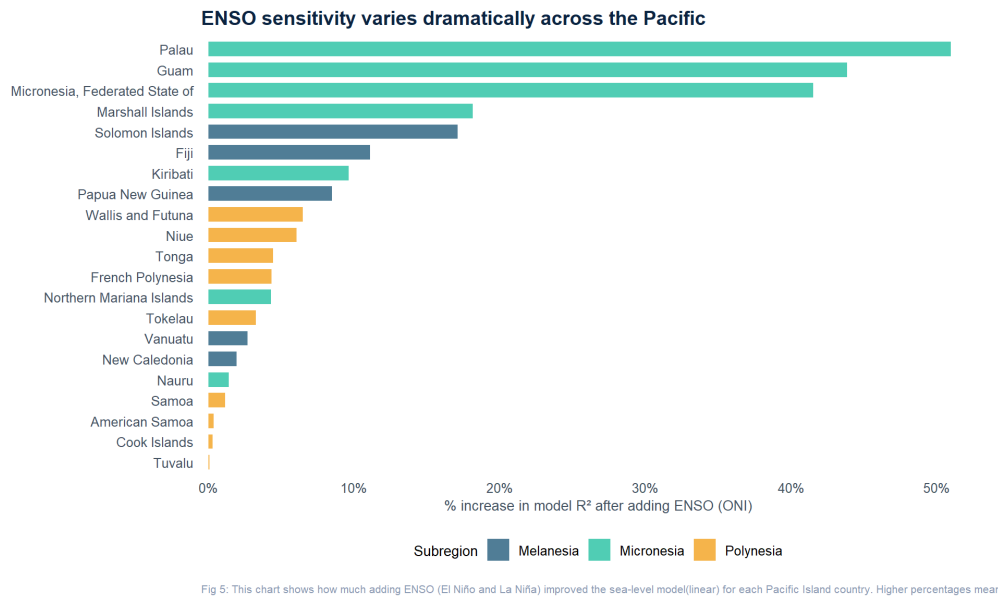
A reasonable question when examining PNG's sea level record is whether natural climate variability — particularly the El Niño–Southern Oscillation — could explain the trend or offer any relief. The short answer is: less and less.

During El Niño events, warm water migrates eastward and sea levels across the western Pacific tend to fall temporarily. PNG, sitting in the western warm pool, should be among the most affected by this suppression. But the data tells a more complicated story.



Comparing 1997–98 and 2015–16 is the key test. Both El Niño events were of similar strength by ONI measures, yet the 2015–16 dip was noticeably shallower. The most likely explanation: the underlying long-term rise had grown large enough to partially offset the El Niño suppression. As the baseline keeps climbing, temporary dips will become progressively smaller relative to the trend.

Sea level anomalies are also measurably lower during El Niño years on average (Wilcoxon test, $p = 0.002$), confirming the suppression effect is real. But it is losing ground to the trend.



PNG lies near the middle of the ranking. Adding ENSO improves the linear model, but the long-term sea-level rise remains the dominant signal. Western Micronesia (Palau, Guam, FSM) shows the strongest ENSO influence (40–50% improvement), whereas most Polynesian countries show little additional improvement (<5%).

A warming ocean compounds the picture

SURFACE AND SEA SURFACE TEMPERATURES

Sea level rise is one dimension of climate change affecting PNG's coast. The same ocean is also warming. Surface temperature and sea surface temperature anomalies are trending upward across all three Pacific subregions — with Melanesia, PNG's subregion, showing a consistent positive signal.

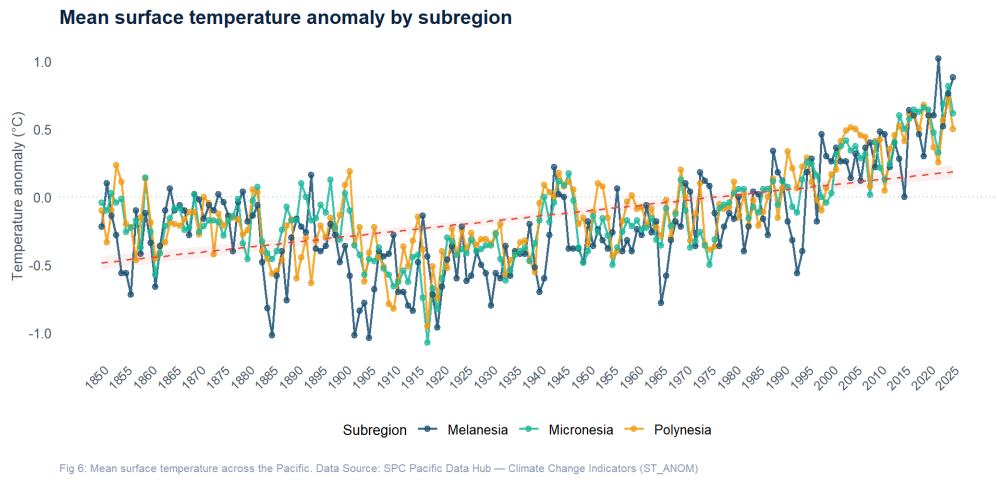


Fig 6: Mean surface temperature across the Pacific. Data Source: SPC Pacific Data Hub — Climate Change Indicators (ST_ANOM)

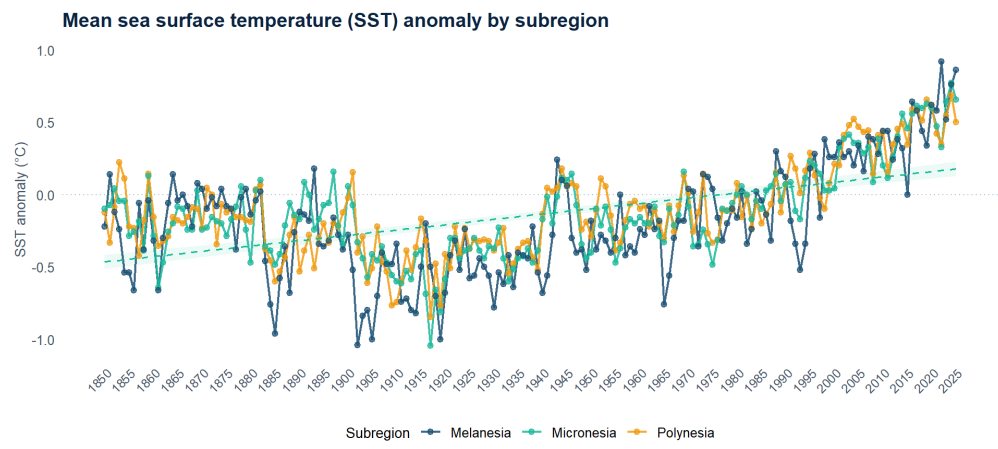


Fig 7: Mean sea surface empareture across the Pacific. Source: SPC Pacific Data Hub — Climate Change Indicators (SST_ANOM)

Rising sea surface temperatures add further pressure: warmer water drives coral bleaching, reduces fish stocks, and intensifies tropical cyclones — all of which affect coastal communities directly. For PNG, where many coastal populations depend on reef fisheries for food security, the SST trend is not an abstract indicator.

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The cost in people and dollars

DISASTER IMPACTS

Climate change translates into economic losses and human displacement through disasters — cyclones, floods, and storm surges. Pacific Data Hub tracks both direct economic losses and the number of people directly affected.

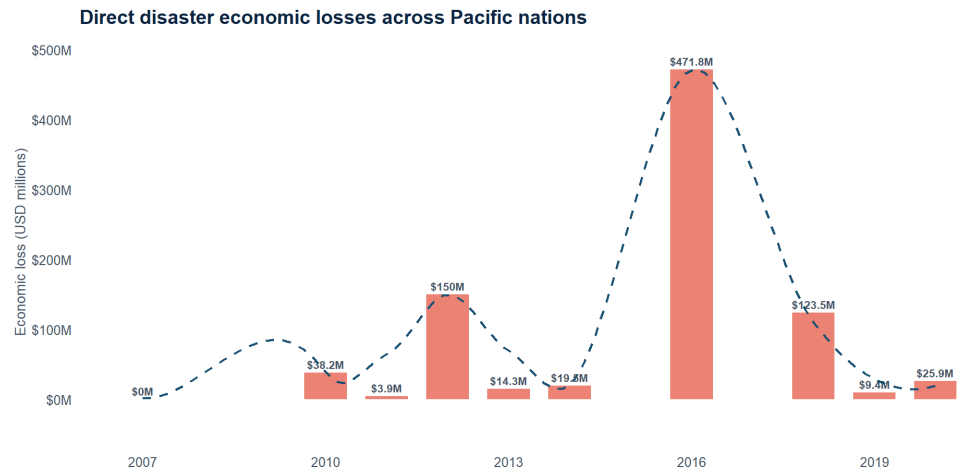


Fig 8: Economic Loss (USD) incurred to the Pacific island countries by natural disaster. Source: SPC Pacific Data Hub — SDG 11.5.2 (Direct disaster economic loss)

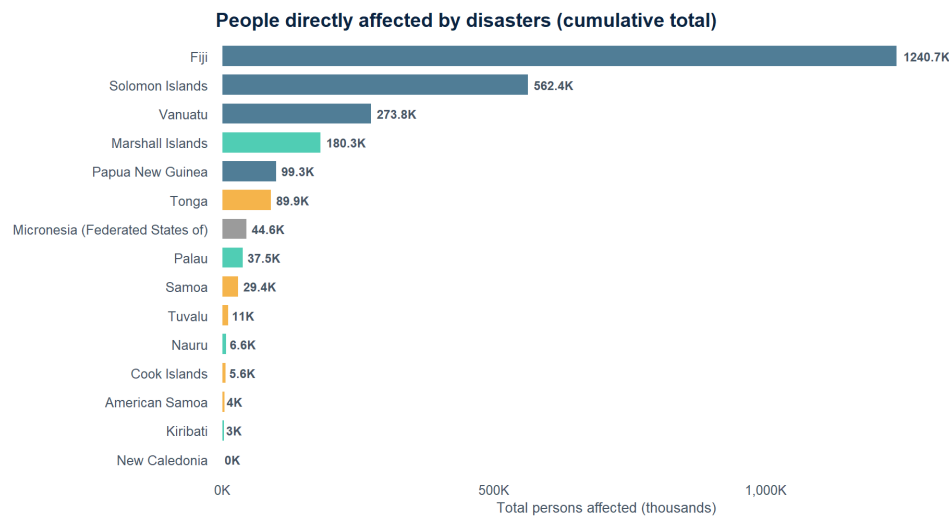


Fig 9: Number of people affected by natural disasters. Source: SPC Pacific Data Hub — SDG 11.5.2 (Persons affected by disasters)



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PNG's exposure, the Pacific's problem

Papua New Guinea accounts for less than **0.01%** of global cumulative CO₂ emissions. The entire Pacific Islands region together contributes under **0.03%**. Yet this dataset places PNG at the top of the sea level rise table — fastest rate, longest coastline exposure, largest population at risk.

The gap between who caused this problem and who is bearing the steepest physical consequences is visible in every chart in this report.

Summary of findings

KEY FINDINGS

This analysis draws on 651 annual observations from 21 Pacific Island nations spanning 1993–2023, across four official SPC datasets.

PNG has the highest rate of sea level rise in the dataset. At 5.4 mm/yr (95% CI: 3.5–7.3 mm/yr), PNG leads all 21 nations. The confidence interval lies entirely above zero.

The rise is universal across the Pacific. All 21 nations show statistically significant positive trends. PNG is fastest, but no country is exempt.

Melanesia has the highest subregional mean rate, though confidence intervals across all three subregions overlap substantially. PNG's rate exceeds even Melanesia's average.

El Niño events suppress sea levels but cannot reverse the trend. Sea levels are measurably lower in El Niño years (Wilcoxon p = 0.002). However, the 2015–16 dip was shallower than 1997–98 despite comparable El Niño strength — consistent with the long-term rise progressively offsetting the suppression.

PNG's ENSO sensitivity is moderate. Adding ONI to the trend model explains some additional variance in PNG, but far less than in western Micronesia (40–50%). The trend, not ENSO, dominates PNG's sea level record.

Surface and sea surface temperatures are also trending upward across all subregions, adding pressure on coral reefs and fisheries alongside the sea level signal.

Cumulative disaster losses reach \$0.9B USD, with 2.59M people directly affected across Pacific nations — the real-world cost of the trends above.

Across every dataset examined here, Papua New Guinea's position is consistent: highest rate, Melanesia's largest nation, and among the Pacific's most exposed coastlines. The trajectory is clear. What happens next depends on decisions being made far from PNG's shores.

Five Official SPC Data Sources

Sea level anomalies (SEA_LVL): [SPC Pacific Data Hub – Climate Change Indicators](#) (1993–2023).

Surface temperature anomalies (ST_ANOM): [SPC Pacific Data Hub – Climate Change Indicators](#).

Sea Surface temperature anomalies (SST_ANOM): [SPC Pacific Data Hub – Climate Change Indicators](#).

Direct disaster economic loss (VC_DSR_AALT): [SPC Pacific Data Hub – SDG 11.5](#).

Persons directly affected by disasters (VC_DSR_AFFCT): [SPC Pacific Data Hub – SDG 11.5.2](#).

Oceanic Niño Index (ONI): [NOAA Climate Prediction Center](#), accessed July 2026.

Methods

Sea level trends were estimated using ordinary least squares (OLS) linear regression for each country and subregion. Annual mean Oceanic Niño Index (ONI) values were included as a continuous predictor to examine the influence of ENSO on sea level variability. Differences between El Niño and neutral conditions were assessed using the Wilcoxon rank-sum test. Data processing, statistical analyses, and visualisations were completed in R 4.5 using the tidyverse, broom, maps, scales, and gt packages.

Pacific Dataviz Challenge 2026: Static Entry

This project is designed by [Keison Tipiou](#)