Sustainability Insights

El Niño: The climate science view of key regional impacts and risks

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- Meteorologists are forecasting a powerful El Niño event that rivals or exceeds intense events from recent decades, with an 81% probability of reaching a "very strong" state in the October-December 2026 window.
- There is high regional variability in historical El Niño impacts, and risk projections should be understood as changes in probabilities rather than predictions. That said, relatively high-confidence impacts include heavy precipitation and landslides in California and other parts of southern North America; warmer winters across northern North America, severe drought in Central and South America and hotter, drier weather that increases wildfire risks across Southeast Asia and Australia.
- The state of other recurring climate patterns, referred to as modifiers, over the coming months can have strong influence on the strength of expected El Niño impacts. Risk management should be regional, focusing on relevant El Niño events from the past and on the modifiers that affect that part of the world.

Since June 2026, major meteorological centers[1] have indicated that El Niño conditions are present in the tropical Pacific and are likely to strengthen through late 2026 and early 2027. The consensus forecast indicates a strong event that is likely to rival or exceed the intense El Niño events of 1982-83,1997-98 and 2015-16, which led to floods, droughts, wildfires and anomalous regional temperatures and tropical storm activity.

El Niño is part of the El Niño-Southern Oscillation (ENSO), a coupled ocean-atmosphere phenomenon centered in the tropical Pacific. An El Niño event occurs when sea surface temperatures (SSTs) in the equatorial Pacific are warmer than average, and it is accompanied by other factors such as changes in tropical convection, winds, pressure and related atmospheric characteristics. The impacts, however, depend on where exactly the warm SSTs

[1] The centers considered here include NOAA CPC/NCEP, IRI, WMO, Australia BoM, JMA, and ECMWF/C3S.

are found. A basin-wide or eastern-Pacific event can produce different regional impacts than a central-Pacific event, even when both are classified as strong.

El Niño is best viewed as a phenomenon that affects the probability of weather or climate-related risks occurring rather than a guarantee that they will occur. A given region may have a higher chance of experiencing the impacts it saw in past El Niño events, but ultimately, the risk will depend on regional exposure, vulnerability, the exact structure of the current El Niño event and other recurring climate patterns. These patterns can amplify, weaken or shift the typical, or canonical, response.

Canonical impacts vary from region to region, but flood risk, drought, anomalous temperatures and modified tropical cyclone pathways are some of the most prevalent. As of July 2026, the S&P Global Climate Center of Excellence has relatively high confidence in the following impacts:

- Increased frequency and severity of heavy precipitation, floods and landslides during the cold season in parts of southern North America such as California.
- Severe drought and heat across Central America, northern South America, Southeast Asia, Southern Africa and Australia, peaking during the Southern Hemisphere summer (December 2026 to March 2027).
- Increased flood risk peaking during the Southern Hemisphere summer in southeastern South America, East Africa and coastal Peru/Ecuador.

Additionally, a strong El Niño impacts tropical cyclone risk by influencing the distribution of tracks and intensity, rather than simply dictating a change in the number of storms globally. Regionally, strong El Niño events:

- suppress North Atlantic seasonal hurricane activity on average but do not eliminate landfall risk, particularly under warm Atlantic background conditions.
- increase eastern and central North Pacific activity, shift North Pacific formation eastward and shift South Pacific exposure eastward. This raises the risk of tropical storm impact for Mexico, Hawaii and island nations in the South Pacific, such as Kiribati or Tuvalu.

The body of this paper first summarizes how ENSO is measured and then discusses the high confidence impacts above, as well as other regional impacts associated with El Niño. An appendix describes the recurring climate patterns, referred to as modifiers, that influence these impacts.

From a business risk perspective, the regions requiring the greatest attention are those where several factors overlap: canonical El Niño risk, the state of relevant modifiers and asset or supply-chain exposure. A strong El Niño indicates where probabilities of various risks are shifted, not where impacts are certain. This framing avoids two common errors that can distort risk assessments: assuming that a strong El Niño guarantees a canonical impact everywhere, and assuming that a suppressed signal at a regional or basin-wide level means local risk is negligible.

Identifying ENSO events

ENSO is a naturally recurring climate pattern characterized by fluctuating ocean temperatures in the central and eastern equatorial Pacific Ocean. It is accompanied by changes in the overlying atmosphere. This climate mode operates on an irregular cycle, typically two to seven years, and is defined by three phases: El Niño occurs when these regional ocean temperatures are warmer than average, La Niña occurs when they are cooler than average, and a neutral phase occurs where conditions are close to the long-term average.

The ENSO state is commonly assessed by monitoring the sea-surface temperature (SST) in the equatorial Pacific based on observational data from satellites, buoys and ships. Of particular focus is a region extending from 170ºW to 120ºW spanning 5º of latitude either side of the equator, an area that captures important SST changes and gradients that influence tropical convection and atmospheric circulation.

Numerous indices assess the ENSO state, but the two most used are the Oceanic Niño Index (ONI) and the Relative Oceanic Niño Index (RONI). These both depend on SST anomalies in the equatorial Pacific, but the RONI minimizes the compounding effects of rising SSTs due to climate change that can over-emphasize the strength of the El Niño signal. In evaluating the overall ENSO state, the indices are used in conjunction with other factors such as wind anomalies, pressure gradients, outgoing thermal radiation and tropical convection. Both indices use a three-month average SST.

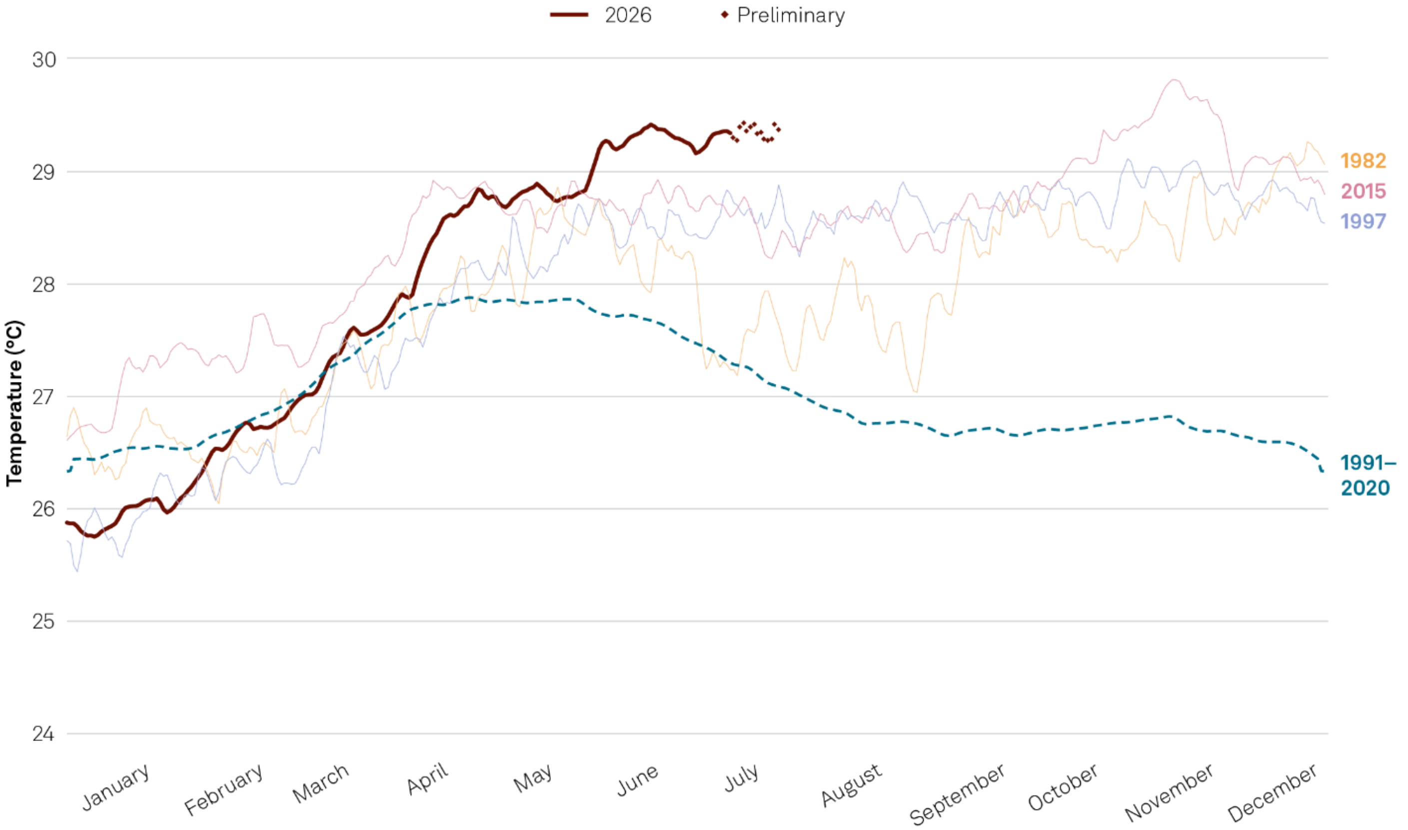
How this El Niño compares to past events

In 2026 so far, SST conditions indicate an exceptionally warm central Pacific (Figure 1). Daily SST values over the Niño 3.4 region of the Pacific have been warmer than any previous record since 1981, the first year of the Optimum Interpolation Sea Surface Temperature (OISST) data set. While part of this warmth is owed to globally rising temperatures, it also provides an early signal of a potentially record-breaking El Niño event.

Figure 1

The 2026 El Niño is reaching SSTs higher than previous very strong events

Daily SST for the Niño 3.4 region in 2026, for the 1991-2020 average, and for three very strong events since 1980

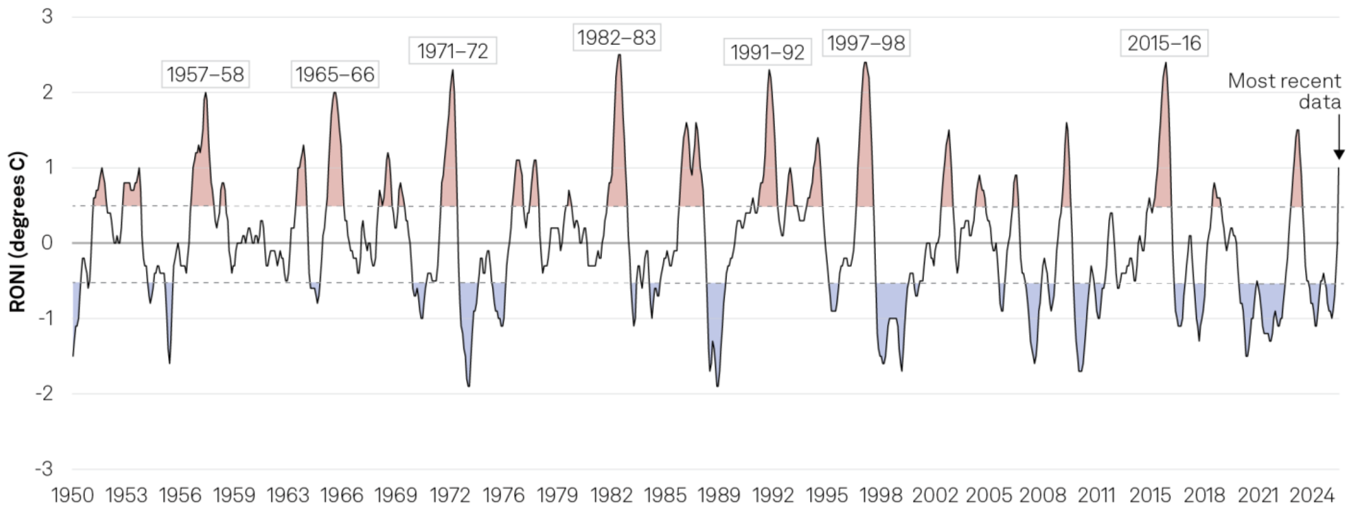


As of July 2026.
Daily sea surface temperature (SST) from NOAA OISST V2.1 and ClimateReanalyzer.org, Climate Change Institute, University of Maine.
Niño 3.4 is a region in the east Pacific Ocean where SST is used to measure the El Niño-Southern Oscillation (ENSO) state.
Source: S&P Global Energy Horizons Sustainable1.

Current (early August) real-time observations show the RONI has already climbed to +1.0 degree C for the May-June-July three-month period. This has resulted in a change of +1.3 degrees C since the 3-month January-February-March value. This is comparable to the rapid rise of previous strong El Niños of 1957-58, 1972-73, 1982-83,1997-98, and 2022-23 (Figure 2).

Figure 2

There have been 7 very strong El Niño events with RONI above 2 degrees C since 1950



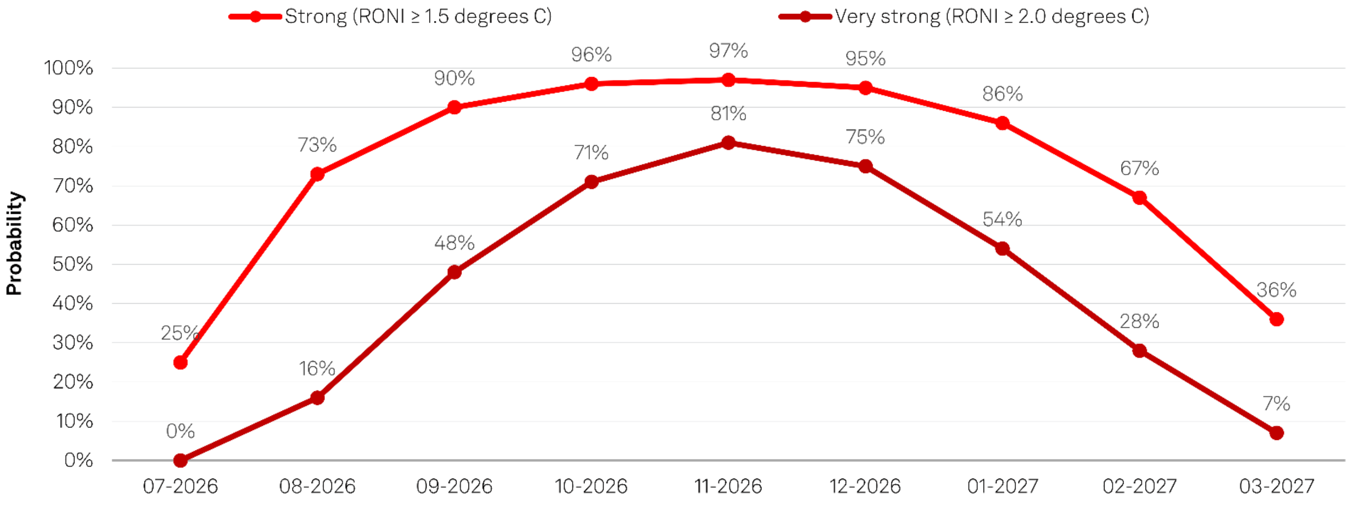
As of August 2026.
RONI = Relative Oceanic Nino Index.
Observed RONI evolution based on ERSSTv5 data as computed by the NOAA National Weather Service Climate Prediction Center.
Source: S&P Global Energy Horizons Sustainable1.

Importantly, forecasts from multiple meteorological centers show a strong consensus for El Niño persistence and strengthening through late 2026 and into winter 2026-27 (Figure 3). There is high probability (73%) of El Niño reaching a strong state as early as the July-August-September period and about a 3 in 4 chance of developing into a very strong El Niño during the Northern Hemisphere winter.

Figure 3

A very strong El Niño state is probable from October 2026

Forecast probability of a strong or very strong El Niño state



As of July 2026.
ENSO = El Niño-Southern Oscillation
ENSO strength probability forecast issued by NOAA Climate Prediction Center. Note that months are designated center months of a three-month average. For example 07-2026 represents June-July-August 2026.
Source: S&P Global Energy Horizons Sustainable1.

Past El Niño events provide useful information regarding the potential impacts. There have been seven El Niño events since the 1950s that reached “very strong” status at their peak (Table 1). Of these seven events, four are of particular note: The 1982-83 event, which is the strongest on record and represents canonical impacts for an eastern Pacific extreme El Niño; the 1997-98 and 2015-16 events, which are the second-strongest on record; and the 1972-73 event, another very strong instance that constitutes canonical impacts. Note that the ranking of these events does not imply a direct linkage to the largest regional impacts as explained in the next section.

The structure and peak RONI of the 2026-27 El Niño remain to be seen. However, given current readings and the background state of Pacific SSTs, the four highest-index “very strong” historical events can serve as benchmarks for the type and magnitude of impacts that may develop over the coming months given current forecasts.

We also note that the warming influence of El Niño typically leads to higher global surface temperatures overall. Years in which the Earth has set surface warming records, such as in 2024, often coincide with the El Niño state.

Table 1

Strongest El Niño events ranked by peak RONI (≥2.0 degrees C)

Event	Peak RONI	Approximate peak season(s)	Implication for interpretation	Summary of notable impacts
Benchmark events				
1982-83	~+2.5°C	NDJ 1982 and DJF 1983	Highest peak RONI among the selected events; one of the canonical eastern-Pacific very strong El Niño events.	• Extreme flooding along the Peru–Ecuador coast • Very wet California winter causing landslides
1997-98	~+2.4°C	OND and NDJ 1997	Canonical eastern-Pacific very strong El Niño; among the clearest benchmark events for global and regional impacts.	• Extreme flooding along the Peru–Ecuador coast • Very wet California winter causing landslides • Heavy precipitation across the Gulf Coast and Southeast • Exceptional flooding in Kenya and Somalia • Severe drought, heat and fire in Indonesia and northern/eastern Australia
2015-16	~+2.4°C	NDJ 2015	Its recency coinciding with generally warmer global temperatures may provide insights about the broad impacts of global warming combined with an ENSO event.	• Heavy precipitation across the Gulf Coast and Southeastern US • Severe drought and peatland fires in Indonesia • Northern North America was anomalously warm with reduced snowpack • Produced the largest global temperature anomaly, partially attributed to recent global warming
1972-73	~+2.3°C	NDJ 1972	A very strong RONI event considered to be a canonical El Niño event. It was also accompanied by a significant positive Indian Ocean Dipole (IOD).	• Severe droughts across the Asian tropics and Australia • Heavy winter rainfall in the southern US and Hawaii • Collapse of the Peruvian anchovy fishing industry

Additional historical very strong events				
1991-92	~+2.3°C	DJF 1992	Very strong RONI event, but interpretation is complicated by the June 1991 Mount Pinatubo eruption.	
1965-66	~+2.0°C	SON and OND 1965	Strong event; generally used as a secondary comparator.	
1957-58	~+2.0°C	DJF 1958	Strong event; retained as a secondary comparator.	

As of July 2026.
Values are rounded and identify basin-scale ENSO amplitude.
Source: S&P Global Energy Horizons Sustainable1.

Historical key impacts

El Niño impacts differ substantially by season and region. The seven very strong El Niño events have produced highly seasonal impacts, and the largest impacts did not necessarily occur during the events with the highest RONI values. Regional impacts depend not only on basin-scale ENSO amplitude, but also on event structure, seasonality, background climate conditions and regional teleconnection pathways. With this variability in mind, some past events will be more relevant to a given region than others. Risk management focused on a particular region should look to relevant historical El Niño events for benchmarks.

Historically, based on the canonical impacts of El Niño events, there are several regions where climate disruption and high risks to business and populations typically occur:

Southern US, California, Northern Mexico and Gulf of Mexico: El Niño events produce their clearest US hydroclimate impacts during the Northern Hemisphere winter, when the subtropical jet shifts storminess toward California, the Gulf Coast and the Southeast. The 1982–83 and 1997–98 events produced very wet California winters, including flooding and landslides, while 1997–98 and 2015–16 produced strong Gulf Coast and Southeast wet anomalies with heavy precipitation.

Northern US, Alaska and Canada: El Niño events favor unusually warm winter conditions across much of northern North America, with reduced snow cover and lower snowpack in many areas. This is not uniformly adverse: It can reduce heating demand and cold exposure, but it can also disrupt snow-dependent water supply, winter recreation, ecosystems and spring-runoff timing. Areas already experiencing persistent drought may face additional water stress.

Atlantic hurricane tracks: During the Atlantic hurricane season, El Niño events suppress Atlantic tropical cyclone activity by increasing vertical wind shear (either speed or direction) and making the tropical Atlantic environment less favorable for storm formation and intensification. The 1982–83, 1997–98, and 2015–16 events all suppressed Atlantic hurricane activity substantially, reducing basin-wide activity and altering track exposure. Nevertheless, the risk of hurricane formation and landfall is not eliminated, particularly against a backdrop of warmer Atlantic temperatures due to climate change.

Central America and South America, including Ecuador and Peru: El Niño events favor major warm-season and wet-season impacts along the eastern tropical Pacific margin. The 1982–83 and 1997–98 events generated extreme flooding along the Peru-Ecuador coast, with fishery disruption and severe coastal damage. Farther north, Central America often experiences drought stress when convection and rainfall shift to the south and east over the Pacific.

Southern Brazil and nearby countries: El Niño events enhance spring-to-summer storminess and wet anomalies across parts of subtropical South America, including southern Brazil, Uruguay, Paraguay and northern Argentina. The strongest impacts are associated with persistent rainfall, flooding episodes, saturated soils and disruption to agriculture, infrastructure and river transport.

Southern and Eastern Africa influenced by the Indian Ocean: El Niño impacts in eastern and southern Africa depend heavily on Indian Ocean conditions and seasonal timing. The 1997–98 event produced exceptional flooding in Kenya and Somalia, among the clearest ENSO-related East African wet signals. In contrast, parts of southern Africa often experienced drought, heat, crop stress and increased wildfire susceptibility during strong El Niño episodes.

Figures 4 and 5 below show maps of temperature and precipitation anomalies that have been historically associated with strong and very strong El Niño events. These maps are constructed based on historical anomalies and only include locations that show local statistical significance and pass a regional field significance test. Significance is assessed via correlation with the RONI time series.

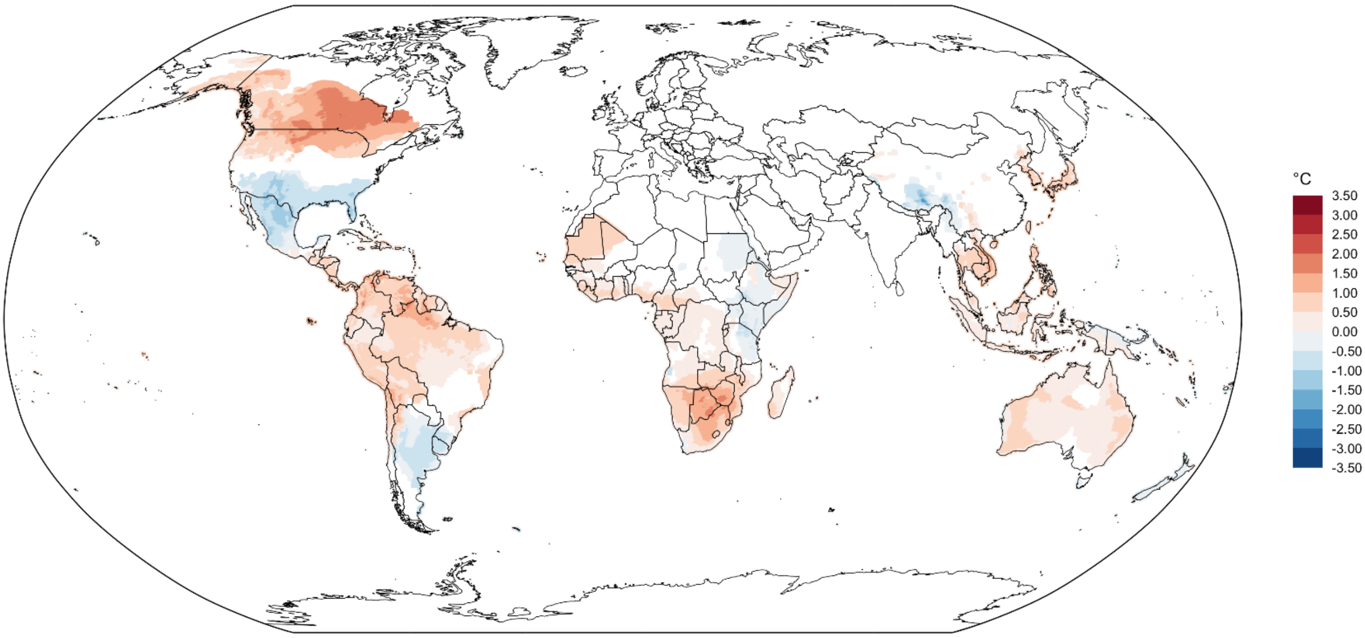
Many regions exhibit no significant impact from El Niño. Europe, for example, is experiencing increasing heat waves and drought during summer, but there is no significant relationship to El Niño, a finding consistent with results of a recent World Weather Attribution study.[2]

[2] Keeping, T. et al. (2026): Fossil fuel emissions have rapidly worsened European heatwaves in just a few decades (WWA scientific report No. 85) World Weather Attribution. DOI:10.25560/130926

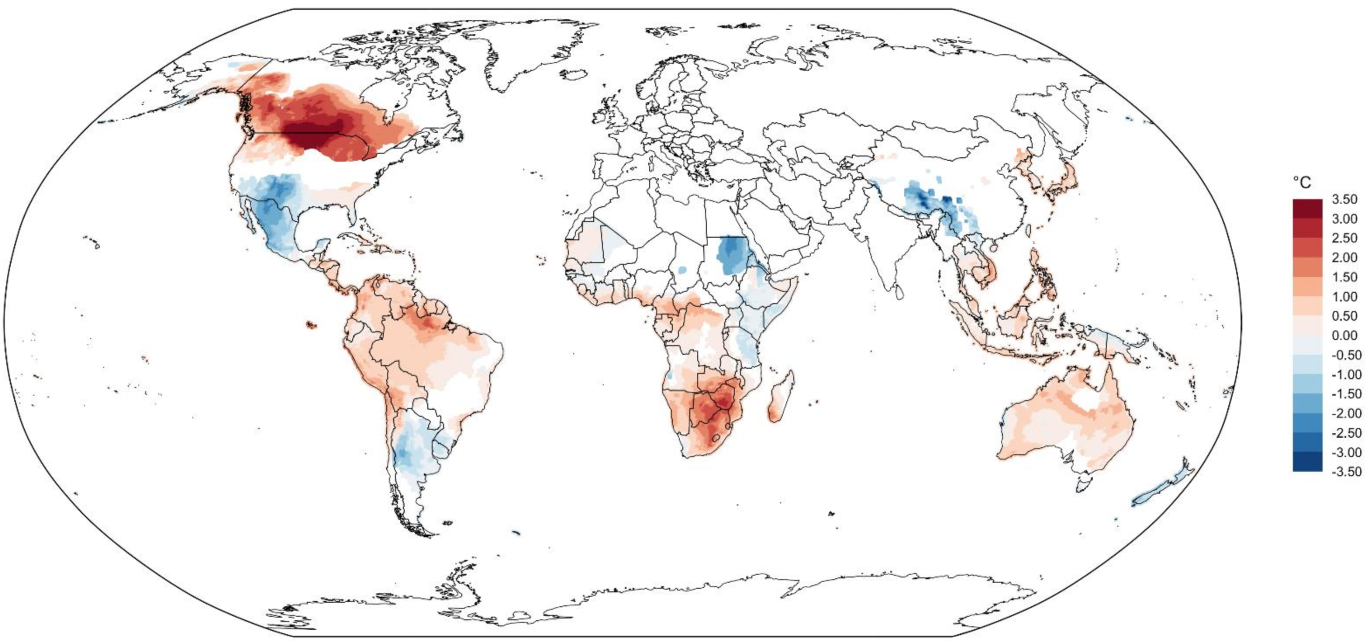
Figure 4

Locally significant ENSO-related temperature anomalies during typical peak RONI season (December, January and February)

Moderate or stronger El Niño (RONI ≥ 1 degree C)



Very strong El Niño (RONI ≥ 2 degrees C)



As of July 2026.

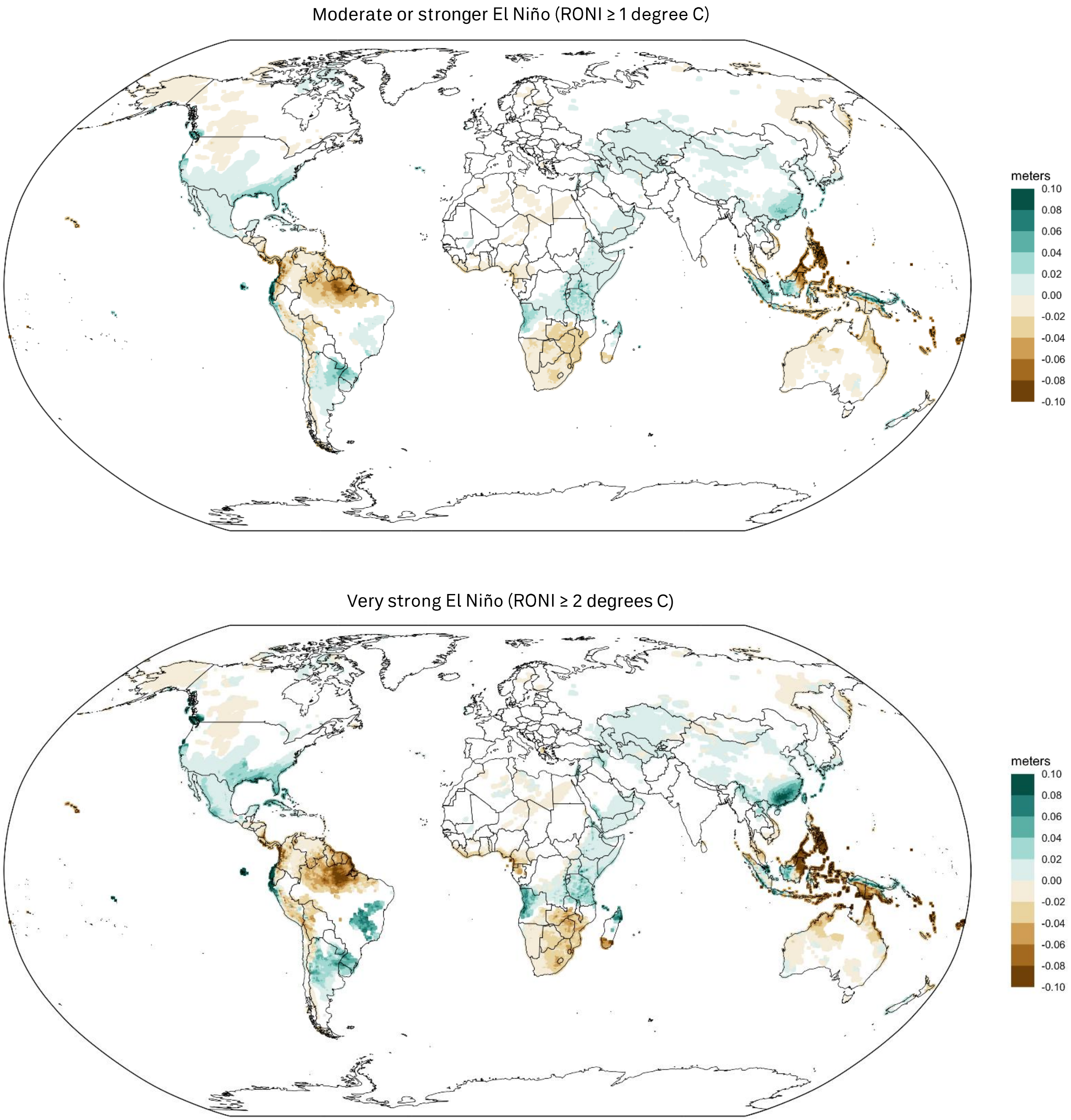
Temperature anomalies (in degrees C) associated with moderate or stronger (top) and very strong (bottom) El Niño events in December, January and February. Map is constructed based on historical anomalies and only includes locations that show local statistical significance and pass a regional field significance test. Significance is assessed via correlation with the RONI time series.

Areas shown without color (white) do not show statistical significance with El Niño.

Source: S&P Global Energy Horizons Sustainable1.

Figure 5

Locally significant ENSO-related precipitation anomalies during typical peak RONI season (December, January and February)



As of July 2026.

Precipitation anomalies (in meters) associated with moderate or stronger (top) and very strong (bottom) El Niño events in December, January and February. Map is constructed based on historical anomalies and only includes locations that show local statistical significance and pass a regional field significance test. Significance is assessed via correlation with the RONI time series.

Areas shown without color (white) do not show statistical significance with El Niño.

Source: S&P Global Energy Horizons Sustainable1.

Summary of potential key impacts of the 2026-27 El Niño

Below, we summarize impacts of primary concern in the coming months as the El Niño cycle develops (Table 2). These are based on our historical understanding of ENSO impacts. The extent to which these impacts materialize will depend substantially on regional climate oscillations in a given part of the world. Depending on their phase, these modifiers may amplify or weaken the expected El Niño impact. One example is the Pacific Decadal Oscillation, in which the temperature in the North Pacific goes through decades-long warm and cold phases. For more information on these additional modes of climate variability, see Table A1 in the appendix.

Table 2

High-confidence El Niño impacts by season and relevant climate modifiers

Ordered chronologically by impact season

Region or hazard domain	Impact season	Expected impacts	Relevant historical events	Current modifier assessment and coming-year expectation
India and the South Asian monsoon region	March-September; heat often March-June and monsoon rainfall June-September	Increased probability of below-normal southwest monsoon rainfall, drought, agricultural losses and water stress, with elevated heat and evaporation risk often most relevant before and during monsoon onset. Drier conditions on average do not preclude localized or short-duration extreme rainfall.	2015-16 and 1997-98; 1982-83 secondary	The ENSO-monsoon relationship is substantial but not deterministic. Conditions across the equatorial western Pacific and Indian Ocean, including the IOD, together with monsoon intraseasonal variability and the longitudinal structure and timing of Pacific warming, can strengthen, weaken or redistribute the rainfall response.
Southeast Asia and the Maritime Continent, including Indonesia, Malaysia, Papua New Guinea and nearby islands	June-November; often strongest August-October. Rainfall deficits and heat may delay onset of wet season.	Increased risk of rainfall deficits, meteorological and hydrological drought, anomalous heat, wildfire and smoke, agricultural losses, water-supply stress and reduced hydropower generation. Risks are generally greatest during the late dry season and may extend into the early wet season. Impacts vary substantially among islands.	2015-16 and 1997-98; 1982-83 secondary	A positive IOD can reinforce drying across much of the western and southern Maritime Continent, whereas regional SST anomalies, monsoon onset, and intraseasonal convection can redistribute drought and heat impacts. December-March conditions should therefore be assessed regionally rather than treated as a uniform Maritime Continent-wide response.
Australia, especially eastern, southern and southeastern Australia	June-February; rainfall deficits and drought risk often most evident July-November, with heat and fire-weather risk extending through December-February	Increased probability of below-normal rainfall during winter and spring, particularly across eastern and southern Australia, accompanied by warmer daytime temperatures, elevated evaporative demand, soil-moisture loss, agricultural and water-supply stress and increased fire-weather risk. Extreme heat may persist or intensify during summer even as the direct ENSO influence on rainfall becomes weaker and more scattered.	1982-83, 1994-95, 2002-03, 2006-07, and 2015-16; 1997-98 was comparatively more scattered for Australian rainfall	El Niño supports elevated heat, drought and fire-weather risk, but Australian impacts are strongly modified by the IOD, SAM, regional SSTs, antecedent soil moisture, and subseasonal circulation. A positive IOD can reinforce winter-spring drying. Background warming increases extreme-heat risk, while seasonal outlooks should guide the expected geographic distribution and magnitude of impacts.
Eastern and central North Pacific tropical cyclones	July-October	Increased activity and possible increased risk for western Mexico, Baja California, Hawaii and the central Pacific.	2015 and 1997; 1982 secondary	El Niño intensification supports higher tropical cyclone activity. Risk depends on regional SSTs, shear, genesis location and steering. Precipitation surges into Mexico and the Southwest US remain plausible even without storm landfall.

Region or hazard domain	Impact season	Expected impacts	Relevant historical events	Current modifier assessment and coming-year expectation
North Atlantic tropical cyclones	August-October	Reduced basin-wide hurricane activity on average, with suppression modified by AMV phase, tropical Atlantic SSTs, ocean heat content, Saharan dust, the West African monsoon and subseasonal variability.	1982-83, 1997-98, and 2015-16; 1965-66; 1972-73 secondary	NOAA indicates that a below-normal 2026 Atlantic season is the most likely outcome because strengthening El Niño-related wind shear is expected to suppress activity. Near- to slightly above-normal tropical Atlantic SSTs provide an opposing thermodynamic influence. Seasonal basin-wide activity may be suppressed, but landfall risk remains possible. Click here for the S&P Global forecast.
Southeastern South America (southern Brazil, Uruguay, Paraguay and northern Argentina)	October-December; sometimes January-March	Increased rainfall and flood risk, including saturated-soil conditions and disruption to agriculture, infrastructure and river transport.	1997-98 and 1982-83; 2015-16 secondary	A strong El Niño supports increased flood and saturated-soil risk. SAM and South Atlantic SST gradients can alter event timing and storm tracks in southern South America, but SAM has limited seasonal persistence.
East Africa	October-December; sometimes extending into January	Increased rainfall and flood risk in many El Niño events, especially when Indian Ocean conditions reinforce the signal.	1997-98; 1965-66 and 1982-83 secondary	A positive IOD would reinforce East African extreme rainfall and flood risk, but the IOD outlook remains uncertain, and forecasts differ on timing and amplitude. Flood risk should therefore be updated as the Indian Ocean SST gradient and regional seasonal forecasts evolve.
Southern Africa	October-March; peak during the main growing season	Increased drought, heat, water-supply, food-security and agricultural risk, with impacts often peaking during the main growing season.	2015-16 and 1991-92; 1982-83 secondary	Indian Ocean SST patterns, including the evolving IOD, and regional circulation can strengthen, weaken or redistribute the canonical El Niño drying signal. Modifiers do not eliminate the principal drought, heat and agricultural risks.
Southern US, California, northern Mexico and Gulf Coast	November-March; peak December-February	Elevated precipitation risk, a more active southern storm track, and increased flood and storm risk, with possible cool anomalies across parts of the southern tier.	California wet winters: 1997-98 and 1982-83 Broader southern US: 1997-98, 1982-83, and 2015-16	El Niño favors the canonical wet southern North America signal. A negative PDO/IPO can weaken or shift North Pacific forcing and reduce confidence in the magnitude and placement of California/Southwest US precipitation. Expect elevated precipitation , but do not assume uniform water-supply improvement, especially for snowpack-dependent basins.
Alaska, western Canada and northern North America	November-March; peak December-February	Warmer-than-normal conditions are common, especially during strong El Niño events.	2015-16; 1997-98; 1982-83 secondary	A negative PDO pattern can oppose or displace aspects of the canonical El Niño circulation over the North Pacific-North America sector, but nonetheless a warm risk remains elevated under strong El Niño and background warming.
Coastal Peru and Ecuador	January-March	Elevated flood and landslide risk along coastal Ecuador and northern Peru when El Niño warming extends into the eastern equatorial Pacific.	1982-83 and 1997-98; 1972-73 secondary	Current risk depends critically on the location of warm SST anomalies. A strong or broader eastern-Pacific anomaly raises concern for coastal impacts.

Region or hazard domain	Impact season	Expected impacts	Relevant historical events	Current modifier assessment and coming-year expectation
Central America, Caribbean and northern South America	February-September	Elevated drought, heat, wildfire, hydropower, and agricultural risk, particularly where rainfall deficits coincide with high evaporation; the magnitude and timing vary substantially across the domain.	2015-16 and 1997-98; 1982-83 secondary	A negative PDO and the tropical Atlantic background state may alter the magnitude, timing and geographic distribution of El Niño-related drying and heat, but not enough to materially reduce canonical impacts.

As of July 2026.
The climate modifiers are defined in the Appendix. PDO = Pacific Decadal Oscillation; IOD= Indian Ocean Dipole; SAM = Southern Annular Mode; AMV = Atlantic Multidecadal Variability; NAO = North Atlantic Oscillation.
Source: S&P Global Energy Horizons Sustainable1.

Conclusion

The expected strong 2026-27 El Niño raises the probability of several well-known hazards, but it does not guarantee that every region will experience a canonical impact.

The highest-priority monitoring regions for the coming year are therefore not simply the regions with the strongest historical El Niño signals. They are the regions where canonical El Niño risk, current modifier state and business exposure overlap. Examples include California and the southern US for precipitation and flood risk; Central America, northern South America, Indonesia, Australia and southern Africa for drought, heat, fire and water stress; coastal Peru and Ecuador if eastern-Pacific warming persists; and all major tropical cyclone basins where El Niño shifts frequency, genesis region or landfall exposure.

For business planning, the appropriate framework is conditional likelihood rather than deterministic prediction. The strengthening El Niño raises the probability of canonical impacts, but modifiers should be tracked through the coming year for clearer signals about whether and to what extent impacts materialize.

Appendix: Understanding the impact of other climate modes

As mentioned above, other modes of variability modulate the impacts of El Niño. This section provides a brief definition of key modes along with current forecast guidance. The expected impacts of these additional modes (if any) are summarized in Table A2.

Table A1
Definition of other climate modes

Name	Definition
Pacific Decadal Oscillation (PDO)	A long-term pattern of ocean-atmosphere climate variability centered over the mid-latitude Pacific basin, characterized by warm or cool sea surface temperatures.
Indian Ocean Dipole (IOD)	An irregular oscillation of sea surface temperatures in which the western Indian Ocean becomes alternately warmer and then colder than the eastern part of the ocean. Also known as the Indian Niño.
Atlantic Multidecadal Variability (AMV)	Variability in the sea surface temperature of the North Atlantic Ocean on the timescale of several decades.
North Atlantic Oscillation (NAO)	A weather phenomenon over the North Atlantic Ocean characterized by fluctuations in the difference of atmospheric pressure at sea level between the Icelandic Low and the Azores High.
Southern Annual Mode (SAM)	A climate pattern characterized by the continuous north-south shifting of the belt of strong westerly winds that encircle Antarctica,

The PDO describes broad North Pacific and Pacific-basin SST patterns that influence North Pacific circulation, the Pacific jet stream, western North American precipitation and North American temperature patterns. The current negative PDO state is an important caveat because it can weaken or shift the classic winter El Niño response over the North Pacific-North American sector. This reduces confidence in the magnitude and placement of California/Southwest precipitation and the full-amplitude of the Alaska/western Canada warmth signal.

The IOD is currently neutral, but seasonal guidance suggests possible positive development during Southern Hemisphere winter-spring. A positive IOD would reinforce dry risk over Indonesia, Southeast Asia and parts of Australia; increase rainfall and flood risk over parts of East Africa; and complicate the South Asian monsoon signal. A positive IOD can partly offset El Niño-related monsoon deficits in some years, but timing and spatial structure relative to monsoon onset and peak rainfall are critical.

The NAO affects the North Atlantic jet stream, blocking, cold-air outbreaks, coastal cyclogenesis and European winter storm tracks. ENSO can weakly favor negative NAO conditions in late winter, but the relationship is state-dependent and has low seasonal predictability. SAM is a legitimate regional modifier for southern Australia, southern South America, New Zealand and Southern Ocean storm tracks, but it should be treated mainly as a shorter-lead Southern Hemisphere circulation factor rather than a stable global ENSO modifier. The MJO is also different from the other modes because it is a moving subseasonal pattern of tropical rainfall. It can strongly affect tropical cyclones, atmospheric rivers, severe weather and rainfall over several weeks, but it should not be treated as a fixed seasonal boundary condition.

Operationally, the most useful approach is to separate slow-moving seasonal context from fast-changing weather triggers. Slow-moving context includes ENSO strength and structure, PDO state, IOD evolution, tropical Atlantic SSTs, AMV-like background conditions, soil moisture, snowpack, reservoir storage and ocean heat content in tropical cyclone basins. Fast-changing triggers include atmospheric rivers, frontal timing, vertical wind shear, steering currents and short-range heat or rainfall forecasts. A business forecast process should combine both: the seasonal El Niño framework identifies regions and sectors needing attention, while subseasonal and weather-scale monitoring determines when specific operational actions are warranted.

Table A2

Additional impacts typically associated with El Niño conditions and climate modifiers

Region or hazard domain	Canonical El Niño impact	Current modifier assessment and coming-year expectation
Eastern US and North Atlantic coast	El Niño can enhance southern-stream storm activity; impacts are strongly dependent on blocking and coastal cyclogenesis.	If late-winter NAO becomes negative, the risk of blocking, nor'easters, episodic cold outbreaks, and enhanced coastal cyclogenesis increases. If NAO remains positive or variable, the canonical El Niño signal is less reliable. This is a conditional risk, not a fixed seasonal forecast.
Europe and Mediterranean	El Niño can weakly favor negative NAO in late winter, implying a possible southward storm-track tendency, wetter southern Europe/Mediterranean, and colder or drier conditions in parts of northern Europe.	NAO predictability is low. Coming-year impacts should be framed as conditional: stronger Mediterranean wet/cyclone risk is more plausible if negative NAO/AO develops during late winter. Without that, ENSO alone is a weak predictor for Europe.
Western North Pacific tropical cyclones	Eastward or southeastward genesis shift; altered tracks and possible stronger storms over longer ocean paths.	El Niño supports a track and genesis redistribution rather than a simple increase/decrease. Landfall risk for the Philippines, Taiwan, mainland China, South Korea and Japan depends on subtropical ridge behavior and intraseasonal variability.
South Pacific and Australian tropical cyclone region	Eastward shift of cyclone activity; reduced activity closer to Australia on average and increased relative exposure farther east.	El Niño favors the canonical eastward shift. A positive IOD and regional SST anomalies can further modify Australian-region rainfall and cyclone impacts. SAM can also alter southern Australian rainfall and Southern Ocean storm-track behavior, but its role is regional and shorter-lead. Individual landfall/heavy-rain risk remains possible.
Indian Ocean tropical cyclones	Regionally complex ENSO influence; impacts depend strongly on IOD, monsoon circulation and ocean heat content.	A positive IOD increases the need for basin-specific monitoring of the Arabian Sea and Bay of Bengal. ENSO alone is insufficient for this region.

Selected sources

- NOAA Climate Prediction Center. ENSO Diagnostic Discussion. Issued 11 June 2026.
- NOAA Climate Prediction Center. ENSO: Recent Evolution, Current Status and Predictions. June 2026 update.
- NOAA Climate Prediction Center. Relative Oceanic Niño Index (RONI).
- NOAA Climate Prediction Center. Official NOAA CPC ENSO Strength Probabilities. Issued June 2026.
- Australian Bureau of Meteorology. ENSO and Indian Ocean climate monitoring update, mid-June 2026.
- NOAA National Centers for Environmental Information. Pacific Decadal Oscillation monitoring page.
- NOAA. 2026 Atlantic Hurricane Season Outlook. Issued 21 May 2026.
- NOAA Climate Prediction Center. Teleconnections: North Atlantic Oscillation monitoring page.
- NOAA Physical Sciences Laboratory and NCAR Climate Data Guide. Atlantic Multidecadal Oscillation/Atlantic Multidecadal Variability index and interpretive guidance.
- European Centre for Medium-Range Weather Forecasts. Seasonal forecast guidance.
- NOAA Climate Prediction Center. Relative Oceanic Niño Index (RONI): Historical El Niño / La Niña episodes (1950-present). https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso/roni/
- NOAA/NCEI. El Niño: A Historical Perspective. https://www.ncei.noaa.gov/access/monitoring/dyk/el-nino
- NOAA/AOML. How does El Niño impact Atlantic hurricane season? https://www.aoml.noaa.gov/how-does-el-nino-impact-atlantic-hurricane-season/
- NOAA PSL. Past ENSO events. https://psl.noaa.gov/enso/past_events.html

Further reading

- CMIP7: Navigating the next generation of climate projections (June 25, 2026)
- How high-resolution data translates flood risk into financial risk (April – August 2026)
- Sustainability Regulatory Tracker (July 27, 2026)
- What a subdued 2026 hurricane season means for businesses and communities (May 21, 2026)