

# INCIDENT BRIEF

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## January 2025 Los Angeles Wildfires: Once-in-a-Generation Events Now Happen Frequently

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### Highlights

1. On January 7, 2025, Palisades and Eaton fires started and burned through urban areas of Los Angeles County, California. They collectively destroyed nearly 16,250 structures, and directly exposed ~41,000 people, ranking them 2nd and 3rd most destructive wildfires in California's history<sup>1</sup>.
2. Started during drought conditions coincident with the Santa Ana winds with wind gusts exceeding 100 miles per hour, the fires rapidly spread into densely populated urban areas, resulting in 29 fatalities and widespread population displacement.
3. The January 2025 Los Angeles wildfires underscore the increasing frequency of deadly wildfires driven by background warming and climate change, development of houses and infrastructure in wildfire-prone areas, and human-caused ignitions such as faulty power lines and fireworks during dry-hot-windy conditions, compounded by the lack of societal preparedness for such extreme events.
4. Home hardening, forest and shrubland thinning, clearing vegetation near human settlements and reducing human ignition of wildfires are among mitigation strategies that can save lives and property in communities in the wildland urban interface.
5. The increasing occurrence of intense urban wildfires necessitates immediate and comprehensive strategies for land-use planning and adaptation to a changing climate, as well as enhanced wildfire prediction and detection technology and improved disaster response.

### Context

Eaton and Palisades fires in Southern California were devastating events, fueled by dry conditions and strong downslope Santa Ana winds. The Eaton Fire<sup>2</sup>, which impacted Altadena and Pasadena, is suspected to have been initiated by faulty power lines, and the Palisades Fire<sup>3</sup>, in Pacific Palisades, is suspected to have been caused by rekindling of a fire from the New Year fireworks (causes are under investigation). Both fires were exacerbated by the region's dry vegetation and the powerful winds, leading to rapid spread and widespread destruction. The impact on people was immense, directly exposing ~41,000 people, claiming 29 lives, and destroying nearly 16,250 structures<sup>2,3</sup>. The high ratio of destroyed structures to population exposure (1:2.5) indicates the low survival rate of structures in these fires. Communities faced evacuations, displacement, and the emotional toll of losing cherished landmarks. While burned areas were not "extreme" in terms of fire size for the region (Palisades: 9,600 ha, Eaton: 5,700 ha), a marked portion (15-20%) of their burned area occurred in urban areas making them the 2nd and 3rd most destructive wildfires in California's history<sup>1</sup>. An era of increasing urban fires pose significant challenges for human wellbeing in a warming climate<sup>4</sup>.

### Findings

This Incident Brief by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) provides a rough estimate of the human exposure to and structural destruction of Los Angeles wildfires of January

data from Sentinel-1 and Sentinel-2 satellites of the European Space Agency, as well as gridded population data by WorldPop, and land cover and jurisdiction data by the United States Geological Survey (USGS). The analysis indicates that direct exposure to Palisades and Eaton fires in Los Angeles County, California, was 20,870 and 20,190 people, respectively. Two smaller wildfires that occurred around the same time but in more rural areas, Kenneth and Hurst fires, directly exposed 489 and 148 people, respectively. Wildfire exposure is defined as the number of people with residence within wildfire perimeters, estimated by overlaying burned area from Sentinel 2 satellite imagery on WorldPop gridded population. Exposure numbers were distributed relatively evenly among the male and female groups. Working-age adults, defined as those between 18 and 60 years of age, accounted for more than half (53-56%) of all exposures across all fires, followed by minors (24-27%), defined as under 18 years of age, and older adults (17-21%), defined as those above 60 years old.

The deadly Eaton and Palisades fires mainly burned through shrublands (60-75%), but also impacted a large urban area, accounting for 15-20% of their burned area. This substantial wildfire encroachment on urban areas explains the high level of human devastation caused by these two fires.

## Drivers

Any wildfire needs three elements: fuel (i.e., vegetation), oxygen, and a source of ignition. In the case of Los Angeles wildfires, abundant precipitation in the prior winter and spring seasons promoted vegetation growth, which was subsequently curated during dry-hot summer and fall seasons, fueling the fires. Rapid shifts from wet to dry conditions, and vice versa, are called “hydroclimate whiplash” events and are promoted by climate change. The Santa Ana winds not only provided a bountiful support of oxygen to the fires, but also promoted their growth through prolonged flames, excessive fire-generated heat, and spread of embers to long distances ahead of the fire front. Finally, ignitions during dry-hot-windy conditions started the Los Angeles fires – without an ignition, fires would not have happened. Climate change has promoted the conditions conducive to megafires by increasing background temperatures and heatwaves, and changing precipitation patterns. For example, the first wetting precipitation event in California occurs later than historically observed, extending the dry conditions into fall and early winter which coincide with the Santa Ana winds – thereby promoting an increase in the frequency of dry-hot-windy conditions. While all situations were ripe for extreme fire behavior, proximity of human settlements to the fires and physical vulnerability of buildings and infrastructure turned

these fires into disasters.

## Recommendations

Human ignitions account for 84% of all wildfires across the United States<sup>5</sup>, and 90% of destructive fires in California<sup>6</sup>. Wildfire ignition prevention policies should prioritize reducing human-caused ignitions. Authorities should further enhance regulations on activities prone to ignitions, such as campfires, fireworks, and debris burning, especially during high-risk weather conditions<sup>7</sup>. Implementing Public Safety Power Shutoff (PSPS) during extreme fire weather could further reduce ignition risks from power lines. Additionally, increased public education campaigns are critical to raise awareness about ignition risks<sup>8</sup>.

To protect communities in the Wildland-Urban Interface (WUI), policies must promote large-scale home hardening initiatives. Offering financial incentives such as tax credits, insurance discounts, or grants for homeowners to retrofit their properties with fire-resistant materials can significantly reduce structure ignitability. Enforcing stricter building codes that mandate the use of fire-resistant roofing, siding, and ember-resistant vents is also essential. Additionally, policies should require and subsidize the creation of defensible space zones around homes by mandating vegetation clearance and maintenance within 1.5 m, and thinning within 30 m, of structures. Engaging local communities in wildfire preparedness through education, training, and volunteer programs can significantly reduce risk. Supporting neighborhood-level evacuation drills and community emergency response teams can further enhance local resilience and preparedness.

To reduce fuel loads – the amount of burnable material including dead and live trees, shrubs, and grasses – and restore vegetation health and resilience, policies should encourage ecologically appropriate vegetation management on both public and private lands, prioritizing areas with overgrown, dense vegetation that contributes to high-severity fires. Such efforts may include expanding prescribed burn programs to reduce the buildup of flammable vegetation. Policies must streamline permitting processes and provide liability protections for prescribed burn practitioners to encourage more frequent and widespread implementation. Collaboration between federal, state, and local agencies, as well as private landowners, is essential for the effective and safe execution of these mitigation measures. Nevertheless, wildfire is expected to continue to occur in many regions, and policies should prioritize investments in advanced wildfire prediction, detection, suppression and response technologies. When wildfires start too close to human settlements, the

focus of the disaster response on evacuations distracts limited resources from saving property. Expanding the use of remote sensing, satellite imagery, and AI-based models for fire prediction and early detection, as well as advanced technology for immediate suppression of wildfire ignitions close to human settlements, can help fire agencies respond more rapidly and effectively<sup>9</sup>. These tools can also help with detecting the high-risk zones to trigger early intervention (e.g. vegetation management).

Stronger land-use planning and zoning regulations are essential to reduce wildfire risk in WUI areas. Policies can limit new development in high-risk fire zones by enforcing stricter zoning ordinances and requiring fire risk assessments before granting building permits. Additionally, introducing buffer zones between new developments and fire-prone areas can reduce exposure. Local governments should adopt fire-resilient landscape design guidelines, promoting the use

of low-flammability vegetation and strategic placement of firebreaks. Incentivizing relocation or buyouts for residents in chronically high-risk areas could further reduce long-term vulnerability.

### Final Remark

The January 2025 Los Angeles wildfires once again underscored the growing vulnerabilities of human communities to devastating extremes, demonstrating how events that used to occur once-in-a-generation now becoming increasingly frequent. The fires highlighted how intensifying drought conditions, and erratic weather patterns—exacerbated by climate change—are making wildfires more frequent and severe<sup>10</sup>. Additionally, they revealed the heightened risks posed by human development patterns in the WUI, where extensive residential areas increasingly overlap with fire-prone landscapes. Furthermore,

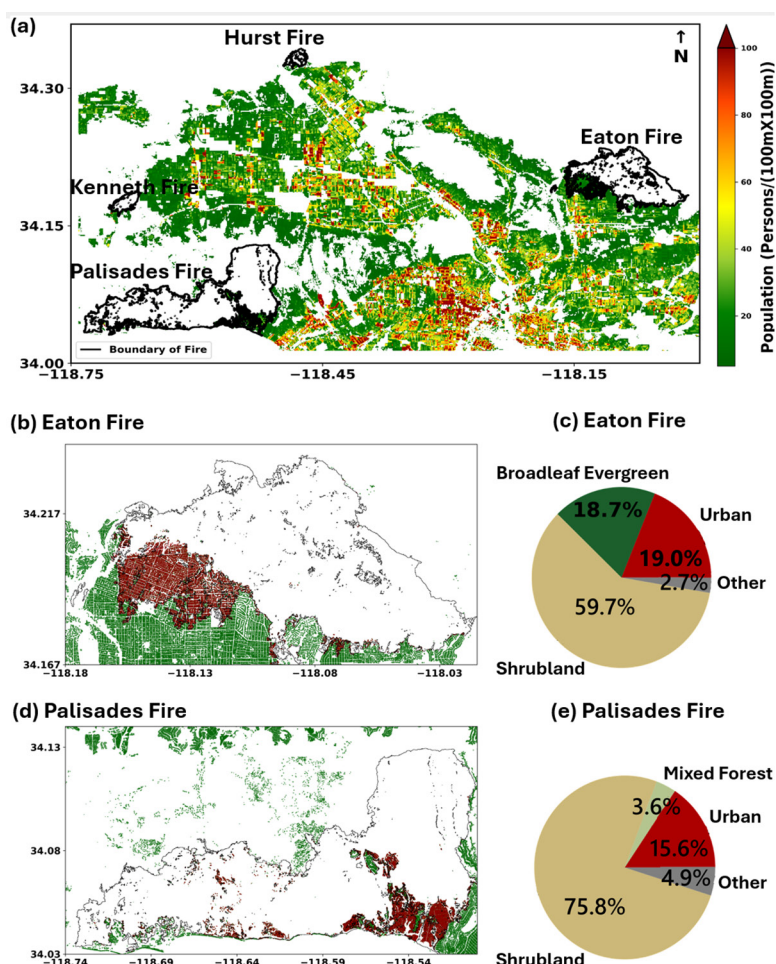


Figure 1. January 2025 Los Angeles Fires. (a) Map of Palisades, Eaton, Hurst and Kenneth Fires on a population density background – population count is demonstrated in 100x100 m grids. (b),(d) Structures within and surrounding burned areas – partially or fully destroyed structures are shown in red and those that survived are shown in green. (c),(e) Land cover impacted by each fire.

human activities, such as infrastructure failures, accidental ignitions, and insufficient wildfire mitigation measures, contributed to the disaster’s scale and impact. The event served as a stark reminder of the urgent need for stronger wildfire prevention policies, improved land-use planning, enhanced disaster response, and climate adaptation strategies to protect vulnerable communities. Finally, the mitigation support provided by Canada and Mexico during this event highlighted the need and value of strengthening transboundary firefighting and emergency management collaborations is ever more needed given the increasing synchronicity of megafires and wildfire disasters.

Table 1. Exposure to Palisades and Eaton fires.

|           | Male     |               |          | Female   |               |          |
|-----------|----------|---------------|----------|----------|---------------|----------|
|           | Age < 18 | 18 ≤ Age ≤ 60 | Age > 60 | Age < 18 | 18 ≤ Age ≤ 60 | Age > 60 |
| Eaton     | 2,755    | 5,736         | 1,770    | 2,636    | 5,757         | 2,253    |
| Palisades | 2,840    | 5,912         | 1,825    | 2,716    | 5,933         | 2,321    |

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