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Implementation Guides August 2021

How to protect urban lives, health and property from wildfire

[Adapting to Climate Change](#)[Air Quality](#)[Spotlight On: Nature-based Solutions](#)Author(s): **C40 Cities Climate Leadership Group, C40 Knowledge Hub**

Cities and their metro regions are increasingly grappling with wildfires (or bushfires) and their devastating effects on lives, homes, businesses, infrastructure, wildlife and air quality. Wildfire smoke can travel great distances, causing respiratory and cardiovascular illness and death in cities far from the fire itself. Wildfires are set to become more frequent and intense in the coming years as temperatures rise and droughts worsen – and tackling wildfire risk is new for many cities. This article collates advice and good practices that could help cities reduce the risk to life and property, drawing on the insights of cities with experience of this issue. The article will be updated as more information becomes available, so if your city has experience or information that could help others, please [get in touch](#).

The connection between climate change and wildfire

Higher temperatures and associated drought conditions make it easier for fires to ignite and spread, leading to more frequent, intense, longer-lasting wildfires. Climate change is also creating greater disparities between land and sea temperatures, causing greater differences in air pressure. This, in turn, produces higher wind speeds, encouraging fires and their smoke to spread further, faster and, thanks to the oxygen carried by the wind, more ferociously.¹

Develop a wildfire risk reduction strategy to prevent local wildfires and reduce their severity



Cities at risk from wildfires at or within their municipal boundaries should take precautions to reduce their likelihood and severity and to manage their effects. Wildfire risk reduction should be the shared responsibility of a range of public and private entities, with priority sectors including land use and spatial planning, housing and utilities, as well as the emergency management sector.

- **Map areas within the city that might be at greater risk from wildfires as part of the city's disaster and/or climate change risk assessment.** Lower-density neighbourhoods in the 'wildland-urban interface' (WUI) – areas that border wilder, vegetated areas and typically contain significant fire fuel – will usually be most prone to wildfire. Fire fuel is dry material, such as fallen leaves and twigs, that can act as kindling. The Austin Fire Department's [Austin-Area Wildfire Hub](#), which acts as a portal for information sharing, cross-agency initiatives and grassroots coalition building to prepare for wildfire, includes a host of maps and assessments of local wildfire risk alongside many other resources.
- **Design and manage green infrastructure to reduce wildfire risk.** On public land, plant fire-resistant vegetation and implement fuel-reduction techniques, such as prescribed burns (where fires are lit under controlled conditions) and the removal of fire fuel. As well as reducing the risk of wildfires starting and spreading, fuel reduction can provide easier access routes for firefighters. There are no 'fire-proof' plants, but low-growing, high-moisture plants with a low sap or resin content, hardwood trees (which are less flammable than pine, fir and other conifers) and other fire-retardant and fire-resistant vegetation will help to reduce wildfire risk.² These species tend to be more heat and drought resistant, too. Create firebreaks in larger vegetated areas, such as forested parks. Also encourage people and businesses in at-risk areas to take responsibility for removing fuel on their property; this should be part of awareness-raising efforts.
- **Incorporate wildfire risk into codes and standards for buildings and infrastructure, working with regional or national authorities where relevant.** Incorporate wildfire-resilient design, materials and siting into codes for new buildings and promote the implementation of retrofitting measures in existing buildings. These codes can apply either to buildings and infrastructure in areas identified as high risk or more broadly. The [International Wildland-Urban Interface Code](#) provides a model code which can be adopted or adapted; cities which have done so include [Austin](#), which became the first city in Texas to adopt such a code in 2020, understanding that over 60% of current structures (and rising) are within a 1.5 mile radius of the WUI.³ Use voluntary programmes and incentives and consider requiring the disclosure of wildfire risk to homebuyers to encourage uptake. In the United States, the disclosure of wildfire risk is currently required in only two states, California and Oregon, whereas 29 states require flood disclosure, such as whether the property sits on a flood

plain or the cost of flood insurance, as part of a sale.⁴



- **Integrate wildfire management into spatial planning.** Update planning policies to discourage low-density urban sprawl and limit the expansion of WUI areas and, with it, wildfire risk. The vast majority of wildfires are started by people, so low-density, high-fuel urban expansion increases the likelihood of sparking a new fire, as well as increasing the damage of fires that do occur.⁵ Also minimise land fragmentation and the construction of constrained road layouts.⁶ Across the United States, planning policies have enabled the number of new homes in WUI areas to grow significantly since 1990. WUI is the fastest-growing land use in the country and a third of homes are already located there, fuelling current and future wildfire risks.⁷ Requiring the disclosure of wildfire risk can also help to discourage urban expansion in at-risk areas but should be secondary to policies that restrict the expansion of the WUI. Even with disclosure policies in place, 645,000 homes are forecast to be built in California by 2050 in areas currently designated as ‘very high’ wildfire severity zones.⁸

Cape Town’s wildfire risk and measures to reduce it⁹

Wildfires are common during Cape Town’s dry season, so much so that the native fynbos vegetation in the Cape Peninsula is fire-dependent as well as fire-prone. It needs to burn every 12-15 years in order for plant species and the animals that depend on them to survive. Suppressing fires for too long leads to high fuel loads which, especially when combined with hot, dry, windy weather, can result in disastrously uncontrollable fires. Some slopes above Cape Town neighbourhoods have historically been kept fire-free for decades. The past introduction of alien trees like pine, wattle and gum also hasn’t helped – these species have invaded fynbos, increasing the fuel available and burning at a much higher intensity than the natural vegetation. Rising temperatures and increased drought linked to climate change, as well as El Niño conditions, further exacerbate the situation.

To reduce the risk of wild fires, the City of Cape Town is implementing measures to reduce the ability of fires to spread rapidly, and to destroy property.¹⁰ In line with national legislation, South African National Parks has been clearing plantations of invasive pine trees from the Table Mountain National Park. Burning the fire-adapted fynbos vegetation in accordance with natural fire regimes, under milder weather conditions and at appropriate intervals is reducing fuel loads and the risk of runaway fires. The city is also exploring options for fire breaks around residential areas, as well as encouraging buildings to be fire-proofed as far as possible by using fire-resistant building materials and clearing gutters and other points where plant material accumulates.

Develop air quality monitoring to manage the health risk from wildfire smoke

Wildfire generates smoke particles that include black carbon (soot) and other forms of fine particulate

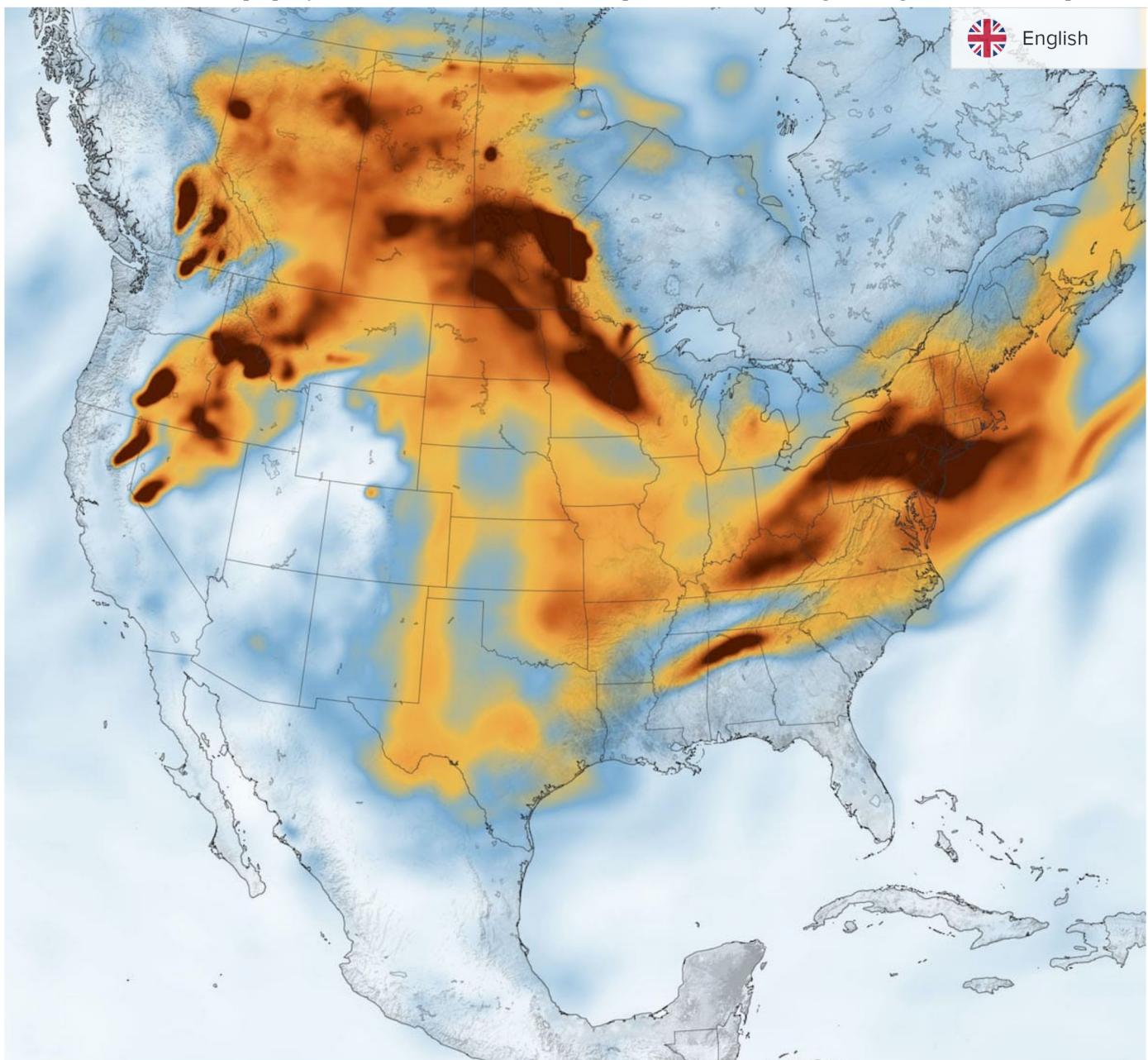


matter (PM_{2.5}). PM_{2.5} contains the most dangerous group of air pollutants, as it can penetrate the lung barrier and enter the bloodstream. Smoke from wildfires that burn buildings and structures (as opposed to wildfires that purely burn vegetation) can also contain high levels of harmful and toxic metal contaminants, including lead, which has been linked to reproductive issues and cancer in adults, as well as behavioural and learning difficulties in young children.¹¹ Wind can carry PM_{2.5} particles for hundreds or even thousands of miles, affecting the health of residents in cities far from their source.

Develop robust air-quality monitoring to acquire the data needed to measure and communicate the air quality and health impacts of wildfire smoke. *How to set standards and monitor outdoor air quality* explains how cities can develop robust monitoring to manage risk from particulate matter, as well as other air pollutants. Cities at risk from wildfire smoke should ensure that measuring PM_{2.5} concentrations in wildfire season is among the specific goals shaping the design of their monitoring networks. In particular, monitoring can target disadvantaged communities that may be less likely to have air-purifying technology at home. Ensure that wildfire experts, as well as local civil society groups, are involved in developing the air quality monitoring plan.

Your city might be at risk from wildfire smoke even if the fires are burning hundreds or thousands of miles away

This was evident in July 2021, for example, when wildfires on the western coast of North America caused haze-darkened skies and obscured skylines on the East Coast, unleashing code red and orange air quality warnings.



In New York City, levels of fine particulate pollution rose above 170 on the air quality index, a level harmful even for healthy people – and a magnitude of particle pollution that the city hadn't seen in more than a decade.¹² Image source: [NASA Earth Observatory](#).

Los Angeles community-based air quality monitoring pilot to help manage the health impact of wildfire smoke

The City of Los Angeles is putting in place a network of 10 Clarity air monitors at five public libraries to provide real-time, indoor and outdoor air quality information. The city will use the data to understand indoor air quality trends in the libraries themselves and outdoor air quality trends in their surrounding areas, as well as to explore the relationship between indoor and outdoor air quality. Sensors are being sited at locations with high pollution burdens, low socioeconomic status, high wildfire risk and high COVID-19 incidence rates. The

sensor network will collect data for a year with a view to understanding the correlation between lung health, equity, smoke events and COVID-19, and the pilot's data will be publicly available.



Develop a wildfire response strategy to protect residents from fire and smoke during wildfire events

Collaborate with regional or national actors to plan and implement actions to protect residents during a wildfire event. Pooled and coordinated emergency operations will typically mean better access to knowledge and resources, as well as consistent public messaging.

In your strategy, be sure to:

- **Seek access to wildfire early warnings.** Through the use of satellite data, fire risk can be predicted up to two weeks in advance and incorporated into weather forecasts. This advance warning can give cities critical time to coordinate a response. In addition, wildfire (heat and smoke) detection technology can alert emergency responders in the early stages of a fire, when a blaze may have the best chance of being extinguished. Cities can invest in these systems or seek access to existing regional, national or global systems, such as the [Global Early Warning System for Wildland Fires](#) and [Global Wildfire Information System](#). Also consider involving residents in wildfire early-warning systems. For example, in 2021, the California Air Resources Board launched a [Smoke Spotter app](#), which provides 24-hour state-wide forecasts, alerts, live air-quality data and more. In Cape Town it is considered a civic duty to report wildfire burning on your property to neighbours and to the Fire Protection Association.¹³
- **Establish a clear wildfire response and evacuation plan, with designated and clearly understood responsibilities for participants.** A wildfire response plan should include, for example, deploying firefighting equipment and infrastructure, such as aerial firefighting planes or helicopters, and establishing evacuation routes and evacuation centres. Also encourage residents to develop their own wildfire preparedness plans; see, for example, the [CAL FIRE guide](#) or Austin's [Ready, Set, Go!](#) guide.
- **Establish the fire danger index and/or air quality index threshold that triggers various alert levels.** An air quality index will support the forecasting, reporting and response to air quality incidents – including, but not usually specific to, wildfires and wildfire smoke events. An index is used to track the most common ambient air pollutants that are regulated under a country's air quality regulations, such as nitrogen dioxide (NO₂), ground-level ozone, particle pollution (PM₁₀ and PM_{2.5}), carbon monoxide (CO), and sulphur dioxide (SO₂), and will focus on health effects and exposure risk within a few hours or days of breathing polluted air. London has a commendable [system](#), though this

is not focussed on wildfire smoke. Cape Town's Fire Danger Index helps the city to communicate clearly how serious the wildfire risk is on any given day, and is linked to a Fire Danger Index Table which explains what residents should do, and not do, at different alert levels.¹⁴

- **Raise awareness and implement measures to ensure that residents can access clean air indoors.**

When air quality becomes dangerously poor due to wildfire smoke, the best way to avoid wildfire smoke is to stay indoors in a space with clean air. At a minimum, residents should close their windows and doors and avoid outdoor exercise. The city can encourage the installation of residential high-efficiency air filters and cleaners. Open clean-air refuges – large indoor facilities with proper ventilation and air conditioning – for people who may be unable to access clean air at home, including unhoused people, people living in poor-quality homes and those unable to afford air filters or cleaners. Consider providing air cleaners to those who cannot travel to clean air refuges. Residents venturing outside can wear particulate respirator masks (N95 or P100) to protect themselves from wildfire smoke (lower-grade surgical or cloth masks used to contain the spread of COVID-19 are inadequate for this purpose).¹⁵

- **Inform residents about why and how to reduce their risk.** Working with air quality and emergency management authorities, communicate about the risk of wildfires and how residents should respond to protect their lives, health and property, both ahead of and during a wildfire event. Australia's Community Fireguard and Berkeley's Wildfire Guide are good examples of community outreach programmes. Use diverse communication channels to convey messages, including television news, radio, social media and other media, as well as community outreach, such as neighbourhood check-in systems for vulnerable residents. Provide clear guidance for institutions such as schools and hospitals and on activities such as outdoor exercise. It is critical that this messaging reach the most vulnerable members of the community. Communicating Heat Risk provides guidance and city case studies on this, which may be transferable to wildfires. Tell residents when and where prescribed burns are being carried out to enable people to prepare for potential smoke effects and to know whether the smoke is from a prescribed fire or a wildfire. Awareness raising campaigns should also connect wildfire events with climate change and to urban planning and other city policies that seek to curb risks, as well as teach residents how to prevent accidental ignitions, such as sparks from electrical equipment or campfires.



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