



THE STATE OF
FIRETECH
ANNUAL UPDATE



DECEMBER 2023

Acknowledgements

The State of FireTech 2023 Annual Update builds on the [first State of FireTech Report \(2022\)](#)¹ to examine emerging trends in how FireTech—the development and application of science, data, and technology innovations—can enable wildfire risk management in sustainable and equitable ways.

DATA SOURCES

This 2023 Annual Update brings together insights from diverse primary and secondary data sources, including:

- [Federal funding](#) data for wildfire management and response (December 2022)
- Wildland Fire Mitigation and Management Commission [Aerial Equipment Strategy Report](#) (January 2023)
- President’s Council of Advisors on Science and Technology (PCAST) Report on [Modernizing Wildland Firefighting to protect our firefighters](#) (February 2023)
- The Nature Conservancy and Aspen Institute [Roadmap for Wildfire Resilience](#) (March 2023)
- Federation of American Scientists’ [Wildfire Policy Accelerator Recommendations](#) (April 2023)
- [Wildfire Resilience Funders Network Survey](#) (May 2023)
- [State of FireTech Survey](#) (June 2023)
- Wildland Fire Mitigation and Management Commission [Final Report](#) (September 2023)

SUGGESTED CITATION

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Executive Summary

Fires are a natural occurrence across biomes, affecting about 370 million hectares² of Earth's surface each year. In the context of ongoing and projected trends due to climate change, wildfire risk is likely to increase in some parts of the world³. Coupled with housing instability and hazardous fuel build up, communities are likely to be increasingly exposed to wildfires⁴ and cascading hazards, including extreme heat, drought, flooding, and debris flow across the wildland urban interface and intermix (WUI).

In addition to the growing economic cost⁵, wildfires also cause chronic public health impacts from exposure to toxic smoke. 27 times more people now experience heavy smoke exposure than a decade ago⁶.

Wildfire disasters worldwide, and especially from Canada's long burning wildfires, contributed to skyrocketing emissions of over 400 megatons in 2023⁷.

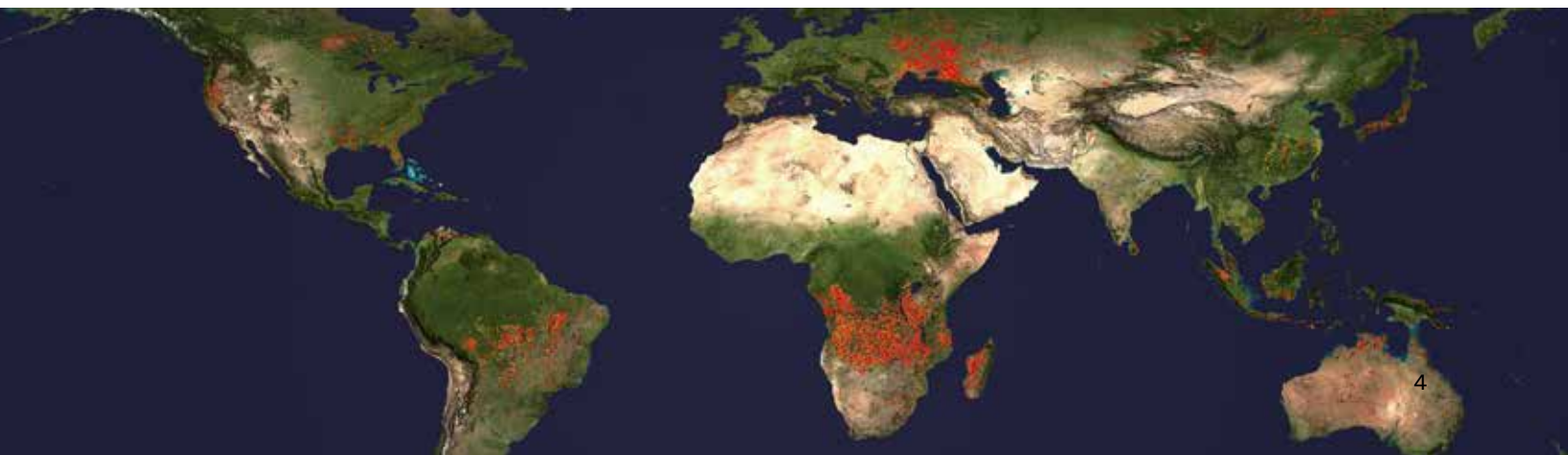
This trend is likely to continue. Climate change and land use change are projected to make wildfires more frequent and intense, with a global increase of extreme fires of up to 14% by 2030, 30% by the end of 2050, and 50% by 2100⁸.

Building on the first State of FireTech Report (2022)⁹, this 2023 Annual Update examines emerging trends in how FireTech—the development and application of science, data, and technology innovations—can enable wildfire risk management in sustainable and equitable ways.

Section I—Year in Review, provides an overview of three key trends that will increasingly come to influence the future of innovation and investments in wildfire risk management:

- Changing fire regimes in the WUI will need better methods to identify the 'fires that matter'¹⁰,
- Increasingly urban impacts of fire highlight the need to prioritize 'mitigations that matter'¹¹,
- Smoke exposure and toxicity will require better smoke management to save lives¹².

In the context of these global trends, the first section identifies five emerging categories of FireTech—Connectivity, Digital, Fintech, Mechanization, and Materials. The section also provides an overview of policy developments and funding tailwinds for science, data, and technology, with a focus on the United States. It shows why there is a need for increased investment and innovation in wildfire mitigation, resilience, and adaptation.



Section II—State of FireTech 2023 Survey, presents findings from the inaugural State of FireTech Survey.

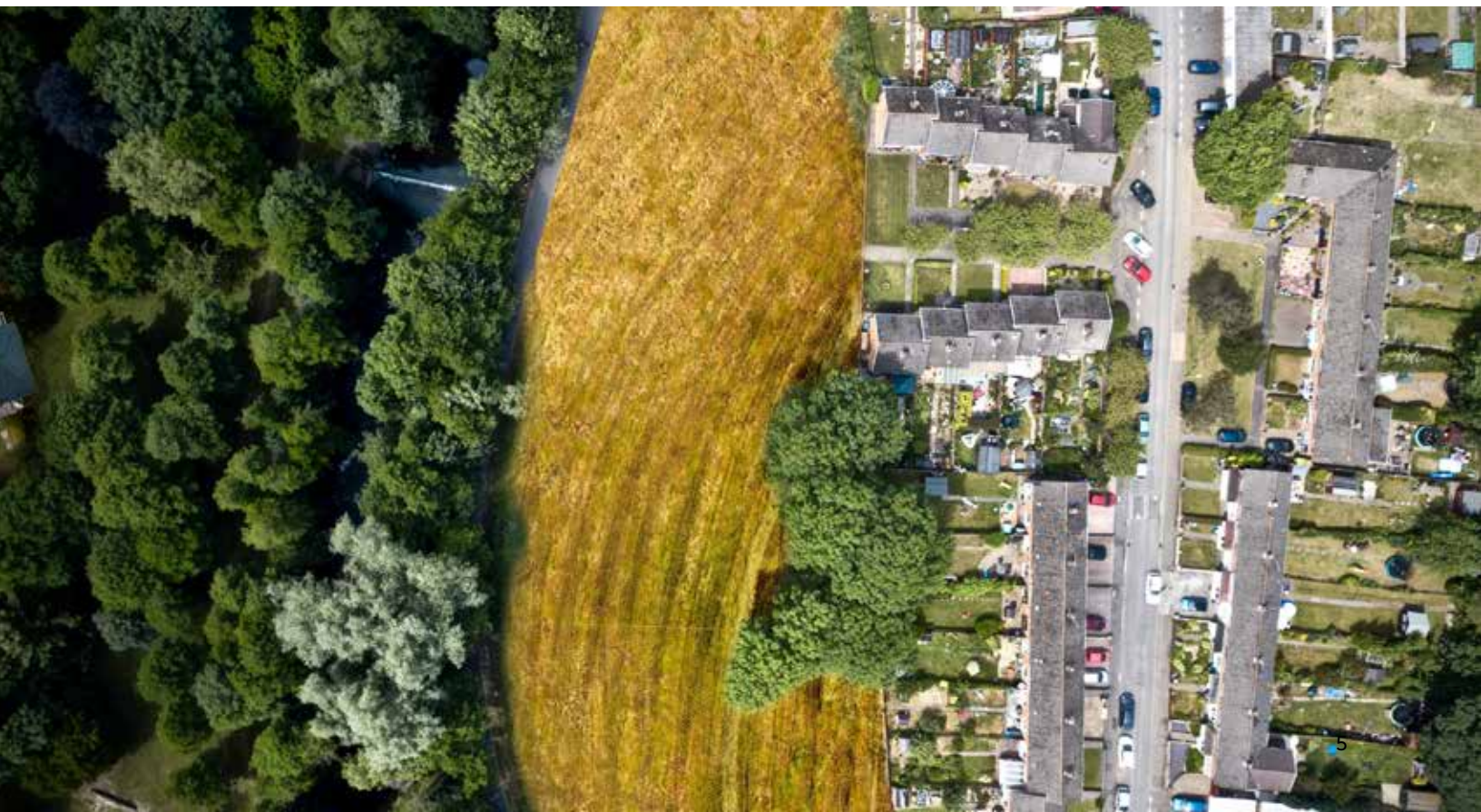
This first survey solicited reflections on the development, application, and scaling of FireTech solutions from four distinct yet overlapping perspectives: entrepreneurs, researchers, end users, and funders.

Key findings include:

- General misalignment between innovation trends, end user needs, and funding priorities (see Section II for details).
- Entrepreneurs report challenges with gaining access to agile and relevant funding, conducting timely pilots and sustained testing with end users, and scaling technology adoption in new markets and geographies.

- End users report challenges with assessing the relevance and usefulness of new technology products, securing funding, procurement, and effectively integrating new technology across agency data and program silos.
- Funders report challenges with not finding enough operators, lack of return on investment, challenges with growing markets in geographies and verticals, lack of scaled adoption by potential end users, as well as a lack of government capacities and infrastructure to effectively distribute funding.

Understanding these gaps and challenges will be important to develop relevant, appropriate, and interoperable FireTech solutions with diverse end user communities on the frontlines of the wildfire crisis.



Section I: Year in Review

1.1 Key Trends

In 2023, communities around the world continued to experience frequent and severe wildfires¹³. The most frequent occurrence of wildfires were recorded in Latin America, followed by North America, Central Africa, South Asia, Russia, Australia, among others.



Figure 1: Wildfire occurrences in 2023 Source: The ESA Sentinel-3 World Fire Atlas (Data displayed for 1 Jan 2023–24 Oct 2023). Accessed Oct 27, 2023. Available: <https://s3wfa.esa.int/viewer>

Across these regions, particular countries experienced severe impacts from flame exposure and prolonged smoke toxicity including Canada, Brazil, the United States, Chile, Russia, Spain, Greece, Italy, Portugal, Syria, and Algeria, among others (see Table 1 for estimates)¹⁴. To date for the year on record, the Canadian wildfires in British Columbia have been the most polluting for many parts of the world and the Maui wildfire in Hawaii has been the deadliest.

Wildfire disasters worldwide, and especially from Canada’s long burning wildfires, contributed to skyrocketing emissions of over 400 megatons in 2023¹⁵. This trend is likely to continue. Climate change and land use change are projected to make wildfires more frequent and intense, with a global increase of extreme fires of up to 14% by 2030, 30% by the end of 2050, and 50% by 2100¹⁶.

Table 1: Estimates of significant wildfire impacts by country (1 Jan—1 Nov 2023)

Country	Area burned (acres)	Deaths (flame exposure)	Population affected	Structures damaged /destroyed	Carbon emissions (Megatons)
Canada	45.7 million ¹⁷	6	200,000 evacuated ¹⁸	200+ ¹⁹	355 Mt ²⁰
Australia ²¹	34.5 million	7	350 evacuated	84	100 Mt
Brazil	11.8 million ²²	No data	No data	No data	90 Mt ²³
United States ²⁴	2.54 million	104+ ²⁵	7,700+ evacuated 60+ injured 100+ missing	12+ damaged 2,207+ destroyed	24 Mt (Arctic circle)
Chile ²⁶	1.1 million	24	2,180+ injured	1,180 destroyed	4 Mt ²⁷
Russia	310,364	21	No data	No data	120 Mt ²⁸
Spain	175,422 ²⁹		3,000+ evacuated	No data	No data
Greece ³⁰	173,000	40	20,000 evacuated	No data	2 Mt
Italy ³¹	143,397	4	No data	No data	No data
Portugal	61,776	55 injured	1400+ evacuated 55 injured	No data	No data
Syria ³²	1,235	1	50,000 affected 40+ injuries	6	No data
Algeria ³³	No data	90	30,000 affected 700 injured	No data	No data

Three interrelated trends—changing fire regimes in the WUI, increasingly urban impacts of fire, and smoke toxicity—will increasingly influence the future of wildfire-related innovation and investments.



1. CHANGING FIRE REGIMES IN THE WUI: IDENTIFYING 'FIRES THAT MATTER'³⁴

- The effects of wildfires in the wildland-urban interface (WUI)—where people live within or near forest/shrubland/wetland or grassland/vegetation—differ across biomes and regions (see Figure 2).
- While Mediterranean forests, woodlands and shrublands cover a relatively small area these biomes present hotspots of recurring and severe wildfires. About 15% of the world’s population lives in grassland dominated WUI³⁵.
- There is high probability that mixed, subtropical, and tropical forests—the biomes with the largest WUI area, will experience increased fire hazard by 2050³⁶.
- Almost 70% of all fire-related tree cover loss over the past two decades has occurred in boreal regions. This trend is worrying because boreal forests, including permafrost, store about 40% of all terrestrial carbon, making them one of the most significant land-based carbon storehouses on the planet. These shifts are likely to make boreal forests a net source of carbon emissions³⁷.

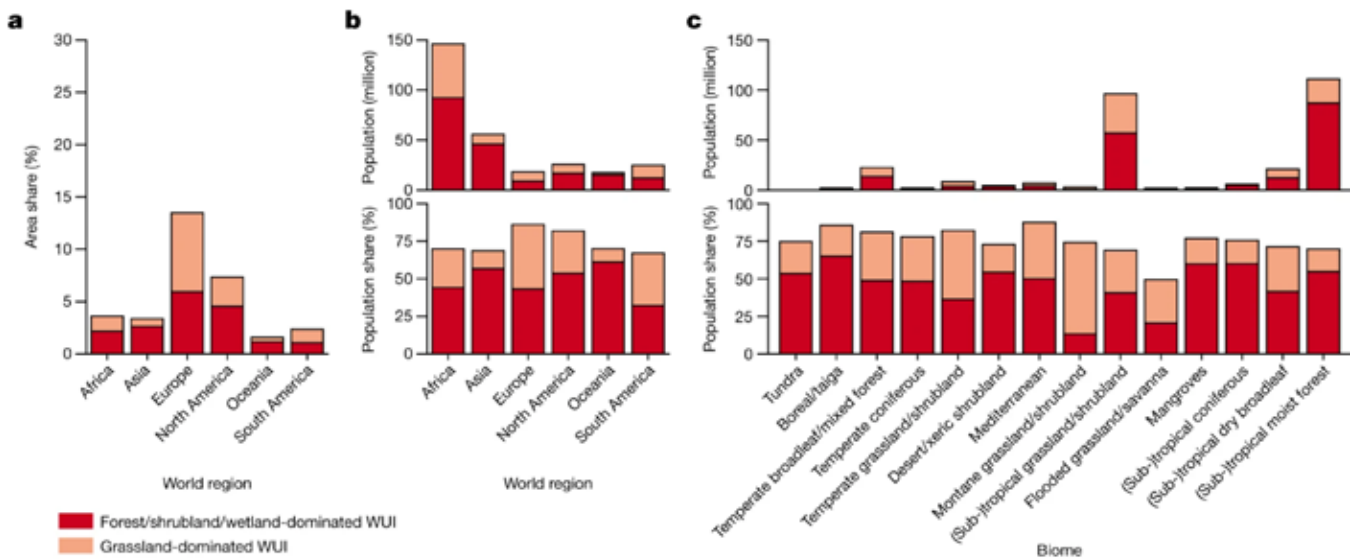


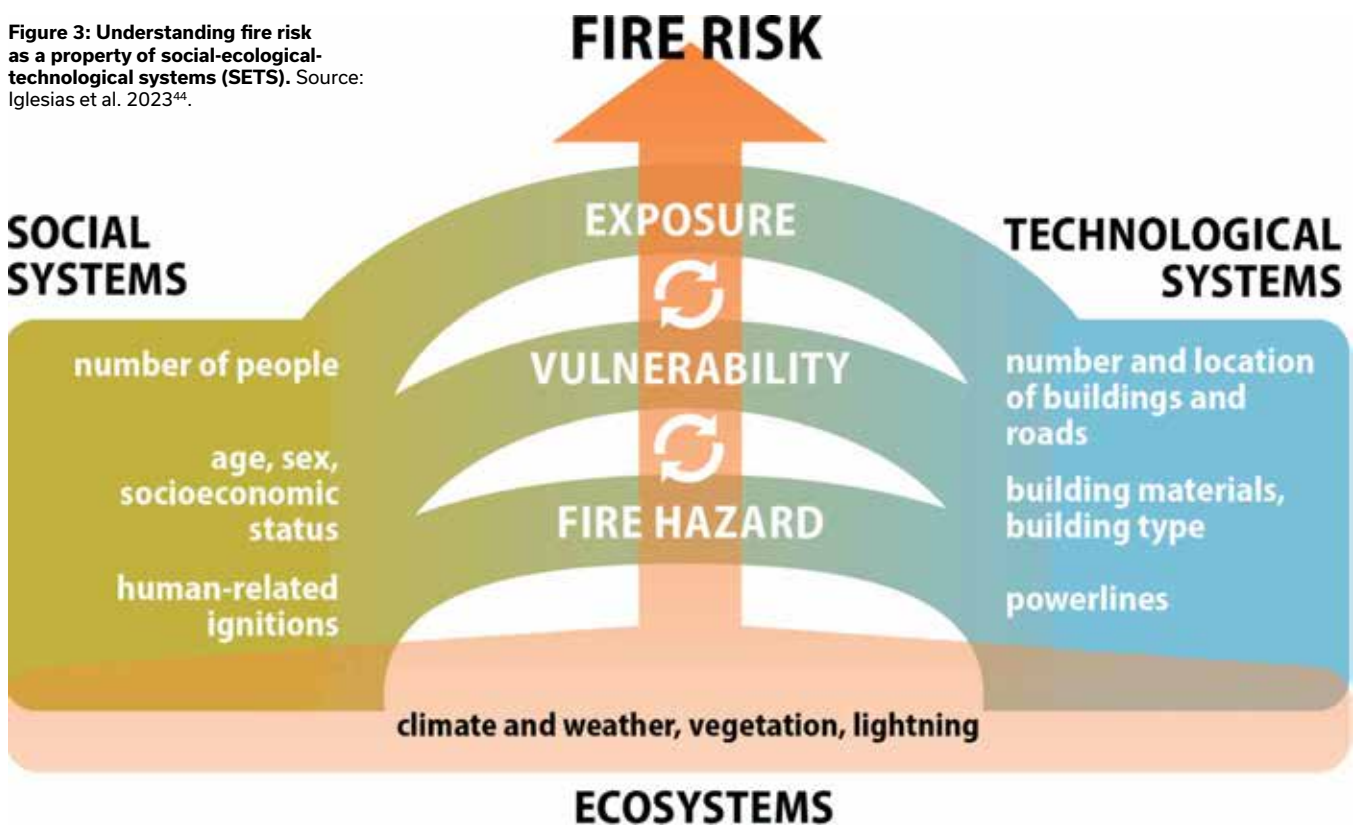
Figure 2: The global wildland-urban interface (WUI). Source: Schug et al. 2023.



2. FIRE IMPACTS ARE INCREASINGLY URBAN: ADDRESSING 'MITIGATIONS THAT MATTER'³⁸

- The 2023 Lahaina fires in Hawaii reiterate a trend that was observed in the 2017 Thomas fire in California and the 2021 Marshall Fire in Colorado: [wildfires are increasingly urban and suburban](#)³⁹.
- This trend is likely to worsen. In the United States alone, an estimated [87.6 million people will live in cities by 2050](#)⁴⁰ literally lending more fuel for larger [urban conflagrations](#)⁴¹. America's wildfire risk in the near future will be primarily from [grassland and shrubland fires](#)⁴².
- Research shows that to meaningfully address 'mitigations that matter', will require understanding fire risk as an emergent interaction between fire hazard, exposure, and vulnerability of people and assets within complex social-ecological-technological systems (see Figure 3).
- Analysis shows the importance of focusing wildfire mitigation efforts in and around the built environment, including through the implementation of appropriate mechanical fuel treatments, prescribed fire, zoning and land use planning, and building codes for home hardening. However, these mitigation measures are currently among the least funded (see Headwaters Economics 2023)⁴³.

Figure 3: Understanding fire risk as a property of social-ecological-technological systems (SETS). Source: Iglesias et al. 2023⁴⁴.



3. SMOKE IS DEADLIER THAN FLAME EXPOSURE: MANAGING SMOKE TO SAVE LIVES⁴⁵

- Longitudinal smoke exposure data in the United States shows that wildfire smoke exposure per person in 2023 was more than double compared to 2022 (see Figure 4) and [27 times more people now experience heavy smoke exposure](#) than a decade ago⁴⁶.
- Recent data shows that mortality is greater from wildfire smoke toxicity than flame exposure. In fact, data from wildfires in the western United States show that the cumulative economic, environmental, and public health impact of wildfire smoke has been consistently worse than damages caused to life and property by flames and embers⁴⁷.
- Also, wildfire smoke impacts are inequitable, disproportionately affecting outdoor workers, unhoused people, children, older adults, and people with pre-existing medical conditions.
- Smoke research in the United States links wildfire smoke with stalled or reversed air quality improvements for 30 states since 2016, with the worst effects in western states⁴⁸.

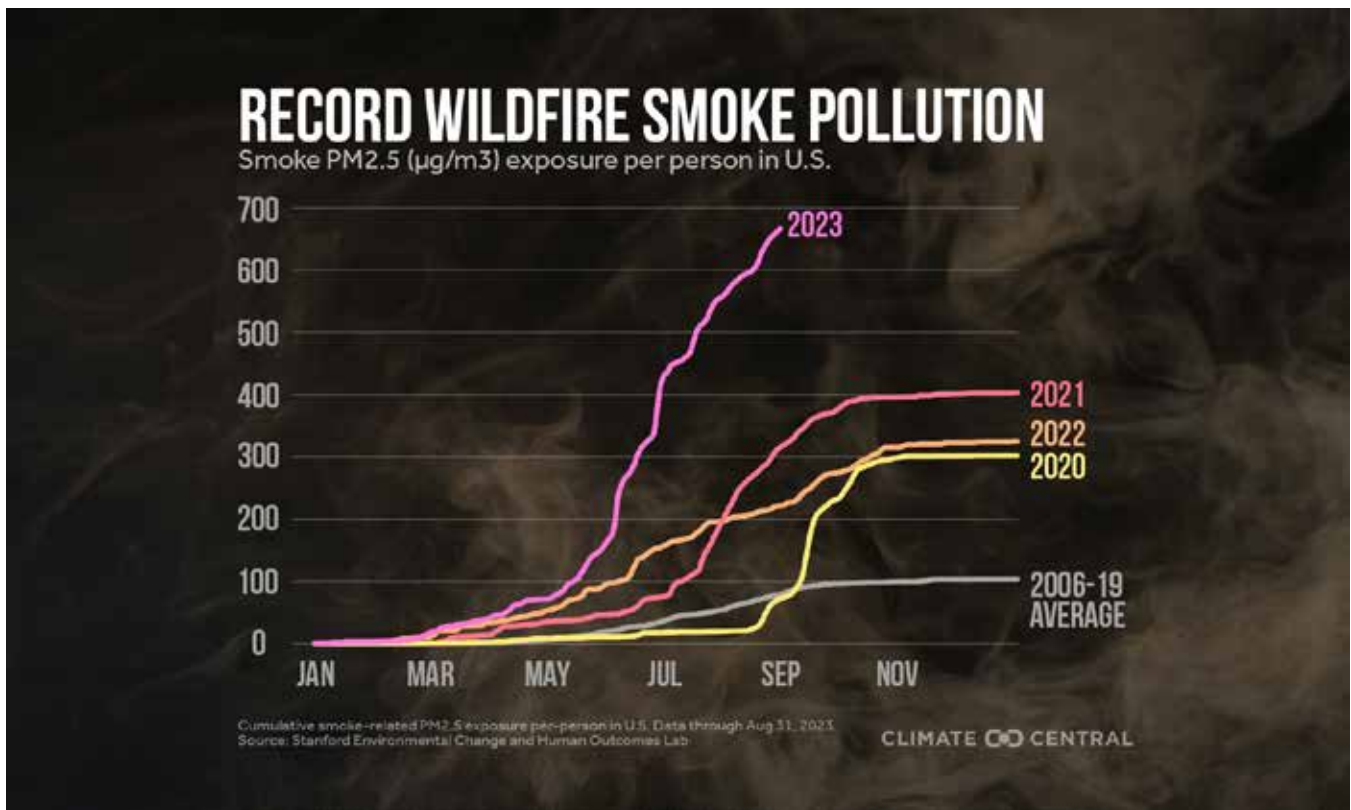


Figure 4: Record wildfire smoke pollution in recent years Source: Climate Central 2023⁵¹.

These trends reiterate the urgent need to bring greater investments in proactive risk reduction, mitigation, and adaptation innovations that can enable resilient landscapes, fire adapted communities, and safe and effective wildfire response management (also see National Climate Resilience Framework 2023⁴⁹). It is

clear that [wildfire prevention, mitigation, and adaptation](#) will be critical to contain future losses and damages⁵⁰. The next section identifies emerging science, data, and technology innovations to mitigate these current and projected global wildfire trends.

1.2 Emerging FireTech categories

The first [State of FireTech Report \(2022\)](#)⁵² defined FireTech as the development and application of at least three kinds of technology trends for wildfire risk management—Digitization, Mechanization, and Materials. This 2023 Annual Update expands the definition to now include two additional technology trends—Connectivity and Fintech (see Figure 5).

This framework represents dynamic and co-dependent technology trends and will remain open to iterations and adaptations.

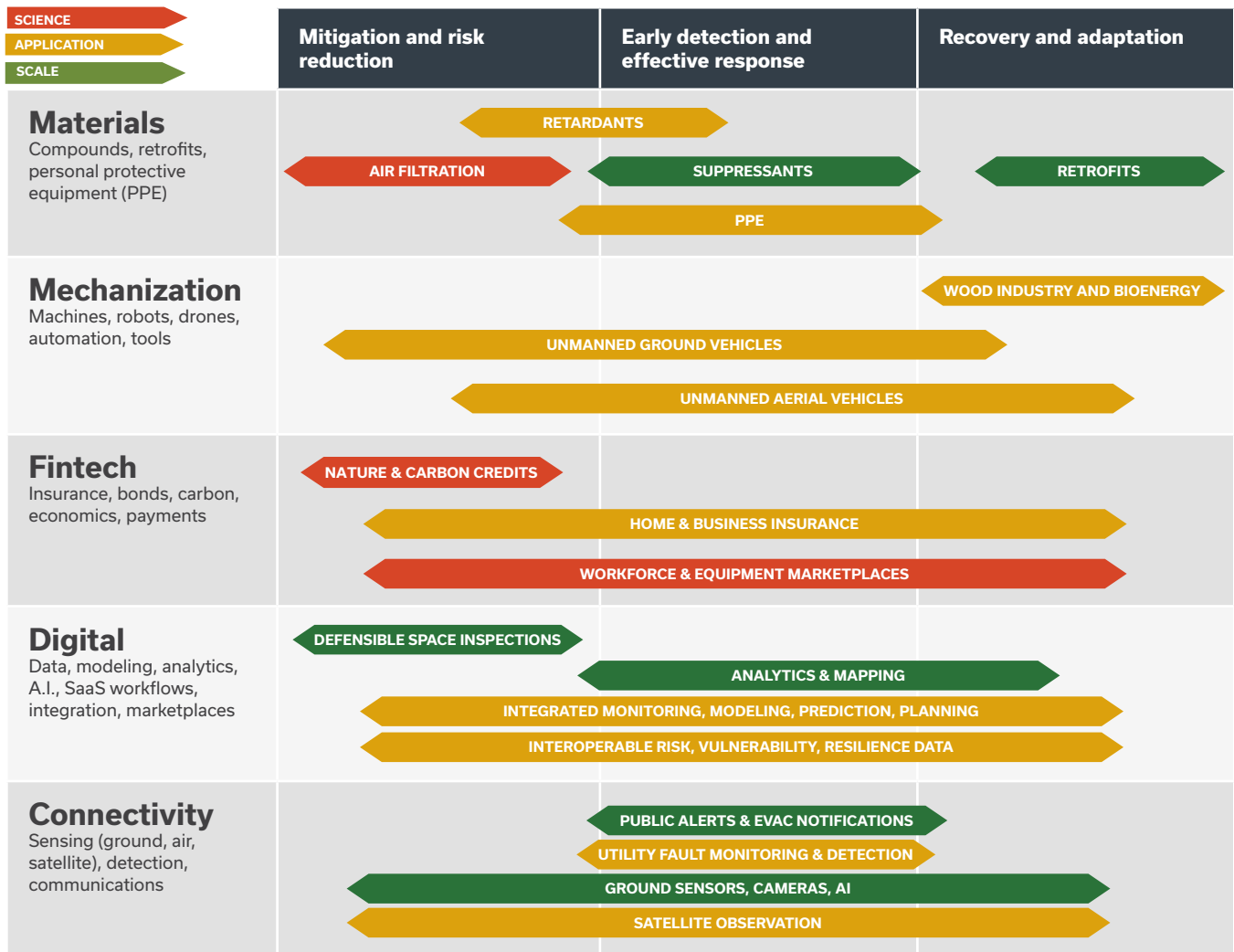


Figure 5: State of FireTech applications for wildfire risk management (2023)

CONNECTIVITY

broadly includes technology that assists with sensing, early detection, and communications. It can include sensor networks (satellite, aerial, ground) and the Internet of Things (IoT) applications for enhanced situational awareness. Enhanced connectivity can generate real-time, precise, and life-saving data for more effective wildfire risk management, for example, through the application of Team Awareness Kits⁵³.

DIGITAL

broadly refers to all data collection, validation, and sharing systems relating to wildfire hazard, exposure, vulnerability, loss, damage, risk, and resilience data. It includes data integration, modeling, analytics, A.I., cloud-based Software as a Service (SaaS) workflows, marketplaces, and intelligent systems to augment end-to-end wildfire risk management mapping, workflows, and information systems, including gamifying learning and trainings. Digitization has been foundational for the development and application of mechanization, financial, and material technologies.

FINTECH

is an emerging category that includes insurance, bonds, carbon economics, and increasingly, payment platforms. The first *State of FireTech Report (2022)* acknowledged that digitization, mechanization, and material technologies in FireTech are being increasingly used in conjunction with related advances in fintech, such as insurance, crypto, and carbon markets, including pricing insurance offerings and guiding public-private investments. Given growing interest in the deployment of financial solutions in wildfire risk management, the *2023 Annual Update* acknowledges fintech as a new FireTech category.

MECHANIZATION

broadly refers to robotics and automation, represented by the development and application of bionics, assistive and collaborative bots, and ground-based and aerial unmanned systems to augment emergency management response and assist fire crews with real-time risk assessment, mitigation, early detection and response, and recovery. Learning from advances in humanitarian tech and disaster tech at large, the most popular kind of robots currently being deployed in FireTech are unmanned aerial vehicles or drones with increasing potential being demonstrated by mechanized solutions including remote operated ground vehicles for more efficient vegetation management.

MATERIALS

include a range of chemicals and compounds, such as suppressants and retardants, as well as engineering, structural retrofits, and tools, and equipment. Perhaps the earliest kind of FireTech materials that have been in use for at least 80 years are foam-based fire suppressants. More recently, material technology has expanded to include a range of organic compounds for use as retardants and ignition agents. These kinds of material technologies are not just being applied in fire response but also for prescribed burns and mitigation actions in wildland-urban interface (WUI) communities. This category also includes building materials and retrofits such as vents, screens, and roofs that allow homeowners to retrofit and 'harden' structures for improved fire defense and smoke protection. Air filtration systems largely remain a white space ripe for innovation.

Progress in the development and application of FireTech solutions can be assessed along the following stages:

1. Research and development: prove the science and test methodology across contexts
2. Pilots and operationalizing: demonstrate applications for community wellbeing and ecosystem resilience
3. Achieving scale: through partnerships across new geographies and verticals

For example, in Connectivity (see Figure 5), two areas marked in green—‘ground sensors, cameras, A.I.’ and ‘public alerts and evacuation notifications’—have proved the science, demonstrated uses in a range of applications, and are in the process of achieving scale across geographies. Building on robust science and engineering, connectivity technologies have been proven over time and are now ready to be widely applied for mitigation and risk reduction, early detection and response, and recovery and adaptation. For example, scaling these applications will need to expand current systems in ways that include public smoke detection, monitoring, and alert systems. Addressing the current smoke monitoring gap could also help spur demand for innovations in air filtration technologies (see Materials under ‘Mitigation and risk reduction’ in Figure 5). Also, it is important to note that scaling technology applications can depend on a range of factors, including local implementation capacities and adequate communication infrastructure, especially in low connectivity environments.

In contrast, ‘utility fault monitoring and detection’ including asset management, marked in orange (see Figure 5), is based on proven science and is currently being applied in some industries and geographies but has not achieved sufficient scale to be considered pervasive. For example, while the science and engineering applications of hardening and undergrounding power lines are now well-known, not too many communities have benefited from applications at scale thus far.

Adapting the priorities put forth by the United Nations [Sendai Framework for Disaster Risk Reduction \(2015-2030\)](#)⁵⁴ current and developing FireTech solutions can be mapped along key priorities for wildfire risk management, which in turn, contribute to the achievement of desired outcomes aligned with the sustainable development goals. In the first State of FireTech Report (2022), four priorities were identified—‘Risk assessment’, ‘Mitigation and risk reduction’, ‘Early detection and effective response’, and ‘Recovery and adaptation’. In this *2023 Annual Update* ‘Risk assessment’ is reflected as a cross cutting priority across the other three main priorities.



1.3 Policy and funding tailwinds

INTERNATIONAL

The international policy environment now widely recognizes that science, data, and technology can enable effective wildfire risk management when implemented with integrated fire risk management objectives and within shared governance frameworks.

In May 2023, the [8th International Wildland Fire Management Conference](#) in Porto, Portugal, released a Landscape Fire Governance Framework recognizing the role of technology in wildfire risk management collaborations among diverse stakeholders:

“Innovation should be transdisciplinary. Policy making and planning, as well as the decision-making process, shall be based on sound and multidisciplinary scientific knowledge, taking stock of technological capabilities and recent innovation. This should, also, try to revive traditional uses of fire under safer conditions and foster benign land-use practices” (IAWF 2023)⁵⁷.”

The 8th IAWF Conference proceedings included three ‘Technical Innovation’ sessions to discuss innovations that help achieve the [goals of landscape management](#) at all value chain steps, such as new platforms for [monitoring and assessing risk](#), early warning, using satellite imagery, supporting operators and data collection. The sessions discussed a range of innovations in the form of new ways of managing fuels, restoring the land, and building back better. including presentations on early wildfire detection using Unmanned Aerial Systems (UASs), utilizing remote sensing data, mapping burned areas using deep learning-based methods.

UNITED STATES

Since 2021, the United States’ policy and appropriations process has seen a similar growing recognition of the [increasing need for science, data, and technology across wildfire risk management](#)⁵⁵.

The recent Addendum⁵⁶ to the National Cohesive Wildland Fire Management Strategy acknowledged that science, data, and technology have not kept pace with the extent of wildland fire and postfire impacts or been fully integrated into decision-making for fire, land, and community managers:

“Science, data and technology are at the core of implementing the Cohesive Strategy, realizing success, and adapting to future challenges...Investment in fire science and technology has lagged, in fact it decreased over the last ten years, and has only started to increase with the drastic damages resulting from wildfires in recent years. Co-production is the best approach to ensure research and data collection and application meets the needs of fire managers. The factors affecting wildland fire are complex and dynamic, which require scientists working with federal, state, tribal, local and non-governmental practitioners and managers to jointly define the strategic information, data and tool requirements in the near future and over the next 10-20 years so that the best science is identified and used when and where it is needed.”

In 2021, the Infrastructure Investment and Jobs Act (IIJA) created the [federal Wildland Fire Mitigation and Management Commission](#)⁵⁸. The Commission was charged with making recommendations to improve federal policies related to the prevention, mitigation, suppression, and management of wildland fires in the United States, and the rehabilitation of land devastated by wildland fires.



As part of its work, the Commission was tasked with developing two reports to Congress: a strategy to meet aerial firefighting equipment needs through 2030, and a final report with a comprehensive set of recommendations to address the nation’s wildfire crisis, including a dedicated chapter on Science, Data, and Technology.

Among the core themes of the Commission’s final recommendations is a call for greater coordination, interoperability, collaboration, and, in some cases, simplification within the wildfire system, including better integration between programs, policies, and workforces as well as improved incorporation of issues and sectors that have traditionally been so far excluded from wildland fire policy or addressed piecemeal.

The recommendations also underline the need to better address fundamental interactions between the temporal phases of wildfire, including pre-fire risk reduction and post-fire recovery, and between communities, landscapes, public health, utilities,

research and technology, and diverse impacted sectors. Given the complexity of this space, overarching systems for accountability, data-driven decision-making and adaptive management are crucial to support efficacy and continued progress toward long-term change. See [here](#) for more on how the Commission’s recommendations relate to FireTech applications⁵⁹.

Early in 2023, the President’s Council of Advisors on Science and Technology (PCAST) put forth [recommendations for modernizing wildland firefighting](#) to make these essential jobs safer, more effective, and fit for purpose in a fiery future⁶⁰. The PCAST report recommendations highlight immediate needs that can be addressed with existing technology as well as strategic, long-term investments in new science and technology to ensure that firefighters do not have to face “tomorrow’s fires with yesterday’s tools” (see Box 1). The report focuses on critical aspects of wildfire response that are stuck—technologically and organizationally—in the last century.

RECOMMENDATION 1

Given the vulnerabilities and shortfalls in wildland firefighter communications, connectivity, and technology interoperability, immediately assess, adapt, and field currently available technologies.

RECOMMENDATION 2

Reverse the current trend of rapidly growing wildfire suppression costs by establishing a joint-agency executive office (hereafter Joint Office) that can accelerate enterprise-level development and deployment of new technologies that enhance situational awareness and initial attack capabilities.

RECOMMENDATION 3

Strengthen the full operational sequence of wildland firefighting— detection, alert, response, and suppression— by assessing existing technologies available within the federal arena, the private sector, and allied nations that could be integrated at each stage.

RECOMMENDATION 4

Accelerate improvement of predictive wildfire modeling tools by expanding research community access to archived satellite data from defense and other government sources.

RECOMMENDATION 5

Expand our nation’s wildfire response capacity by encouraging development and field demonstration of prototype autonomous detection, assessment, and containment systems for wildland fire.

Box 1: Recommendations for modernizing wildland firefighting Source: PCAST Report (2023)

FUNDING

Since 2020, federal allocation and spending on wildfire risk management has been unparalleled in the United States’ history.

The 2021 [Infrastructure Investment and Jobs Act](#) (IIJA)⁶¹, also known as the Bipartisan Infrastructure Law (BIL), and the 2022 [Inflation Reduction Act](#) (IRA)⁶² together provided USD 24 billion in funding for wildfire suppression, hazardous fuels reduction, community preparedness, home hardening and mitigation, and forest restoration, distributed over 40 different programs and administered by at least a dozen agencies. Further, in 2022–2023, the [USDA invested more than USD 48.6 million](#) through the Joint Chief’s Landscape Restoration Partnership for projects that mitigate wildfire risk, improve water quality, restore forest ecosystems, and combat climate change⁶³.

These recent federal investments have been responsive to a growing body of evidence that shows the [value of investing in wildfire mitigation](#)⁶⁴, including forest management, fire-resistant construction, structural retrofits, and landscaping, to reduce the severity and

cost of wildfires. Although mitigation funding has substantially increased in recent years, the scale of the problem will require additional and sustained investments.

In recent years, an increase in funding allocations and spending on forest innovation and wildfire risk reduction technology has also been reflected in state budgets. For example, of its \$1.3 billion allocations, California [committed more than \\$46 million](#)⁶⁵ for Driving Innovation and Measuring Progress (California’s Wildfire Resilience Action Plan Goal 4), including for the creation of decision support tool—[Planscape](#)⁶⁶, creation of a forest data hub, investments in understanding carbon sequestration and creating a carbon forest budget, as well as investing in the state-wide application of LiDAR, GIS, and prescribed fire monitoring programs, among others.

PHILANTHROPY AND PRIVATE CAPITAL

FireTech is poised for a boost from unprecedented government funding in the United States, and philanthropies and corporates are leaning in.

In 2023, 37 funders from the [Wildfire Resilience Funders Network](#)⁶⁷ collectively reported about \$85 million in grantmaking budget for wildfire-related efforts for 2023, with a slight increase in budgets expected over the next 3-5 years. In this sample, FireTech is represented in at least 28% of funder's budgets but longitudinal trends in technology and innovation related grantmaking remain to be seen.

Significantly, in 2023, the Gordon and Betty Moore Foundation announced a \$110 million, six year investment as part of the first of two planned phases for its recently launched [Wildfire Resilience Initiative](#)⁶⁸. Aligned with federal priorities, the Moore initiative is focused on securing healthy ecosystems and resilient communities through three key strategies:

- **Early-fire interventions** that reduce the threat of extreme wildfire and enable beneficial fire through improved and integrated early detection, assessment, and response
- **Pre-fire community interventions** that decrease communities' fire disaster risk through implemented mitigations
- **Pre-fire ecosystem interventions** that reduce ecosystem vulnerability through improved stewardship

These key strategies are supported by three cross-cutting strategies: developing a deeper understanding, creating enabling conditions, and operationalizing measurement and evaluation.

In private capital, the first exclusively FireTech focused VC firm—[Convective Capital](#)⁶⁹—raised 35 million and invested in 11 FireTech startups in 2022–2023. These portfolio companies are developing FireTech solutions across all areas of wildfire risk management— mitigation and risk reduction, early detection and response, and recovery and adaptation.

Aligned with the [National Cohesive Wildland Fire Management Strategy goals](#)⁷⁰, Convective Capital's investment thesis has developed along the following categories: resilient landscapes (see [BurnBot](#)⁷¹, [Treeswift](#)⁷², [Instinct](#)⁷³ and [Overstory](#)⁷⁴), fire adapted communities (see [Delos](#)⁷⁵, [XBuild](#)⁷⁶, and [Fire Aside](#)⁷⁷), and early detection and response (see [WindBorne](#)⁷⁸, [Pano](#)⁷⁹, [Rain](#)⁸⁰, and [Gridware](#)⁸¹).

According to Convective Capital's estimates as of early 2023, over 275 FireTech companies are operating across 25 countries and have together raised about \$1.9 billion. These companies are most concentrated in response (103 companies), followed by landscape resilience (73 companies), community risk mitigation (60+ companies), and enabling technologies such as connectivity and drones (4+ companies).

FireTech trends can also be read within the overall market sentiment for climate tech investments, which have seen an overall decline over the past five years, but relative to all start-up investment, climate tech has seen an increased share in recent years⁸².

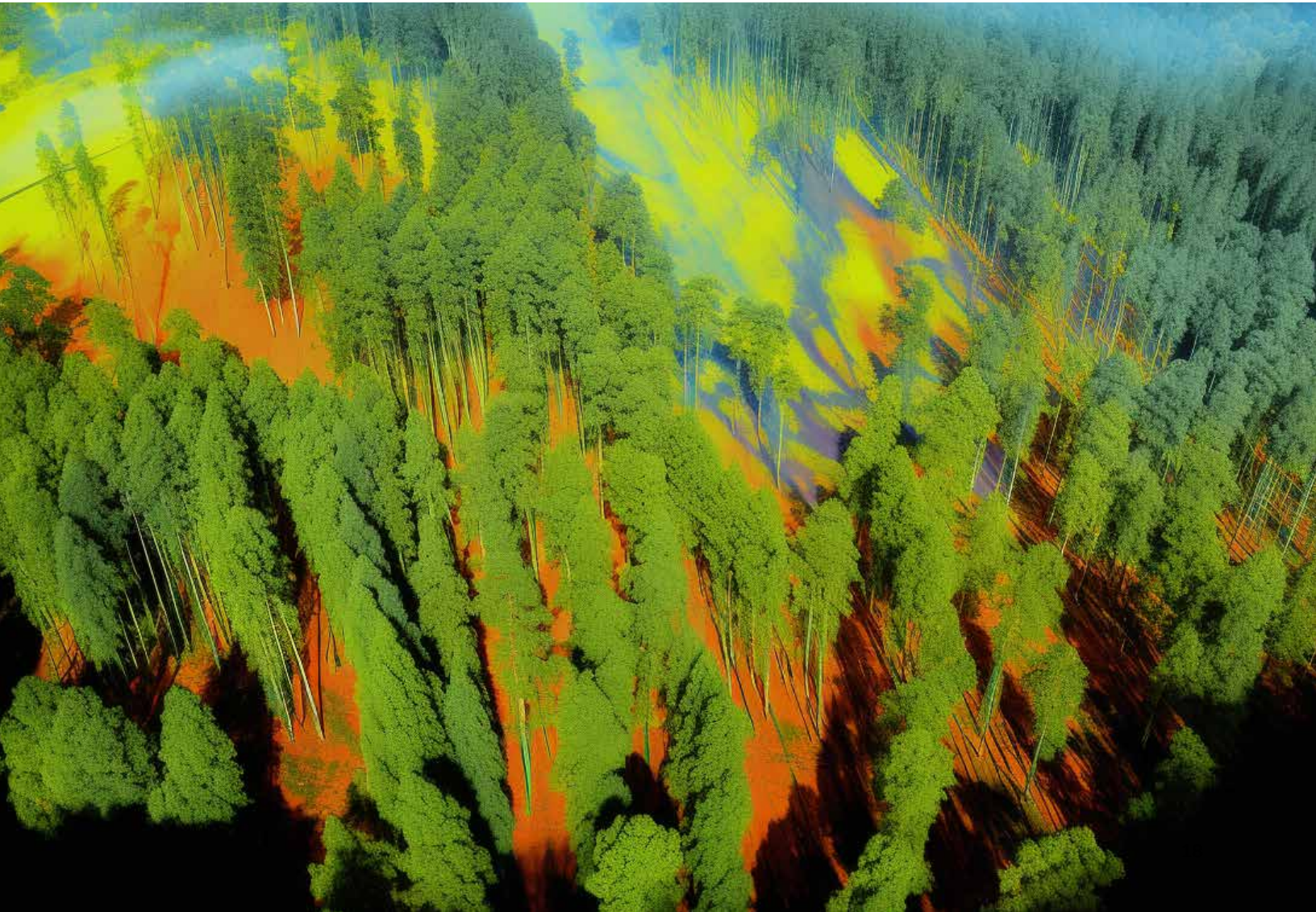


Adaptation solutions remain a significant blind spot⁸³ within climate tech. Historically, adaptation has been underfunded and of the few startups that have been funded in past decades, many failed because they struggled to find a bankable and sustained base of customers among local authorities, municipalities, fire departments, and other public-sector agencies, including utilities tasked with disaster response management. According to PwC's *2022 State of Climate Tech Report*, only 1% of venture funds go towards adaptation technologies that mitigate or respond to climate impacts and natural hazards.

Enter FireTech and it seems this picture could be changing. The insurance sector is leaning in to wildfire risk mitigation⁸⁴ and venture capital is exploring how technologies can safely scale the use of prescribed burns, which will likely create new markets for

adaptation⁸⁵. However, successful adaptation remains a policy and research challenge for FireTech. Next steps include scaling up cost-effective investments in physical protection to reduce wildfire losses, ensuring well-functioning insurance markets to absorb risk that cannot be cost-effectively mitigated, and addressing disparities in pre-fire protections and post-fire recovery for socially vulnerable and marginalized populations⁸⁶.

Also, the United Nations climate summit—COP 28⁸⁷, could play a role in tackling this challenge by focusing the agenda on climate adaptation and resilience technologies, including FireTech. Market trends are likely to continue in a way that help climate tech at large, including FireTech, to reach scale. As carbon emissions from wildfire smoke continues to rack up, funding from climate tech will likely migrate into FireTech to reduce wildfire risk and carbon emissions.



FIRETECH IN THE NEWS

In 2023, critical and ongoing debates in popular media reflected on the extent to which new technology can seemingly 'solve' the wildfire crisis in the absence of system-wide engagement, including with 'Indigenous technology' (see [here](#)⁸⁸) and the insurance sector (see [here](#)⁸⁹).

Such debates are leading to more nuanced discussions within industry about the potential of crowdsourcing and co-creating technology for public benefit (see for example Watch Duty, [here](#)⁹⁰) as well as learning from traditional and historic land management practices (see for example BurnBot, [here](#)⁹¹).

Such emerging industry [best practices](#)⁹² acknowledge that to be effective, wildfire management technology will need to be developed, deployed, and scaled in conjunction with traditional, cultural, and local environmental knowledge and land management practices within shared governance frameworks⁹³.

Convenings such as the Red Sky Summit (held on 29 November, 2023, in Alameda, CA), among others, could help facilitate regular and open conversations about responsible innovation as well as create greater alignment on FireTech priorities and outcomes among diverse stakeholders.

Some highlights of U.S. media coverage in 2023:

- Quartz: [FireTech: A match for Silicon Valley](#) (March 2023)
- TED: [The growing megafire crisis - and how to contain it](#) (April 2023)
- SF Chronicle: [This is the robot that is scorching California's fire-prone landscape](#) (July 2023)
- Bay City News: [PG&E seeks solutions at Innovation Summit](#) (July 2023)
- Fast Company: [AI wildfire detectors, controlled burn robots: Inside the future of FireTech and the VC making it happen](#) (July 2023)
- CNN: [Convective Capital Backs FireTech Firms](#) (Aug 2023)
- Forbes: [Startups Think They Can Beat Wildfires, But Insurance Companies Aren't Buying It Yet](#) (Aug 2023)
- YouTube: [Wildfires are out of control. Computer Vision can stop them.](#) (Aug 2023)
- Bloomberg: [AI, Robots, and Satellite Sensors Are Helping in the Fight Against Wildfires](#) (Sept 2023)
- WSJ: [How Better Tech Could Save Lives in a World of Bigger, Faster, More Devastating Fires](#) (Sept 2023)
- Axios: [Wildfire startup Rain raises \\$9.7M led by DBL](#) (Sept 2023)
- TIME: [Best inventions of 2023. Stopping wildfires, ALERTCalifornia and Cal Fire AI Wildfire Detector](#) (Oct 2023)



Section II: State of FireTech 2023 Survey

2.1 Aim

The aim of the inaugural *State of FireTech 2023 Survey* was to gauge key stakeholder sentiment in developing, applying, and scaling FireTech. This first survey was designed with the acknowledgement that FireTech engages diverse people and institutions across sectors and scales of activity—including entrepreneurs, researchers, end users, and funders. Understanding the experiences and sentiments of these diverse and emerging FireTech communities will be important to develop a robust understanding of the kinds of investments and capacities required to build responsive technology solutions for wildfire risk management across geographies.

2.2 Methodology

The survey was sent by email to the [Wildfire Resilience Funders Network](#)⁹⁴, via social media, including Twitter and LinkedIn to an international network of FireTech entrepreneurs, researchers, developers, users, and funders. The survey link was also shared with a FireTech developer community through the AidArena slack channel.

Survey participants were asked to self-identify in one of four categories: entrepreneur, researcher/developer, end user, and funder. The survey acknowledges overlaps between these categories. This is also reflected in survey respondent's comments and responses.

For clarity, the survey defined the four categories and encouraged respondents to identify a primary category they would respond to—see Definitions below. Survey respondents who did not identify with these categories were encouraged to share more about their work under 'Other'.

All responses have been anonymized for privacy and confidentiality. The survey was open from May 31, 2023, until July 16, 2023. Responses were received between June 2–July 5, 2023.

DEFINITIONS

You are a **FireTech entrepreneur or founder** if your organization was created to develop wildfire risk management technology solutions, products, or services.

You are a **FireTech researcher or developer** if you contribute to developing wildfire risk management technology solutions as part of broader institutional mandates in the public or private sector.

You are a **FireTech end user or operator** if you represent a public, private, or community entity that regularly uses or applies FireTech solutions, products, or services.

You are a **FireTech funder** if you currently fund or invest in the development of FireTech solutions, products, or services.

In all, five responses were received in the 'other' category, including from a Fire Safe Council in California, a non-profit that provides funding to farmers affected by wildfires, an outfit that offers business development for fire modeling, as well as two anonymous and incomplete responses.

2.3 Key findings

1. General misalignment between innovation trends, end user needs, and funding priorities, for example:
 - › Most respondents in the entrepreneur category report a focus on developing 'early detection and response' technologies (77%) followed by a focus on 'risk assessment, modeling, and prediction' (57%) technologies, 'mitigation and risk reduction' technologies (46%), and recovery and adaptation (30%).
 - › However, most respondents in the end user category report a focus on adopting 'mitigation and risk reduction' technologies (83%) and 'risk assessment, modeling, prediction (83%)', followed by 'early detection and response' (66%), and 'recovery and adaptation' technologies (50%).
 - › All respondents in the funder category report a focus on funding 'risk assessment, modeling, and prediction' technologies (100%), followed by an equal focus on 'mitigation and risk reduction' (80%) and 'early detection and response' (80%) and lastly, on 'recovery and adaptation' technologies (60%).
 2. Entrepreneurs report challenges with access to agile and relevant funding, conducting pilots, user testing, and scaling technology adoption in new markets and geographies.
 3. End users report challenges with assessing the relevance and usefulness of new technology products, securing funding, procurement, and effectively integrating new technology across data and program silos.
 4. Funders report challenges with not finding enough operators, lack of return on investment, undeveloped markets across geographies and verticals, lack of scaled adoption by potential end users, as well as a lack of government capacities and infrastructure to effectively distribute funding.
- In addition to a continued focus on improving early fire detection and enhancing risk assessment methodologies, it is now clear that scaling the implementation of wildfire risk mitigation and adaptation actions will be critical to contain future damages and losses.

SURVEY RESPONSES

The survey received a total of 80 responses across the four main categories, see Figure 6 below. However, there were overlaps across the categories. Of the total respondents, 12 marked themselves as reporting against 2 or more categories, most often a combination of 'entrepreneur' and 'researcher', and 'entrepreneur' and 'end user' resulting in a total of 26 incomplete responses, a majority in the researcher and end user categories.

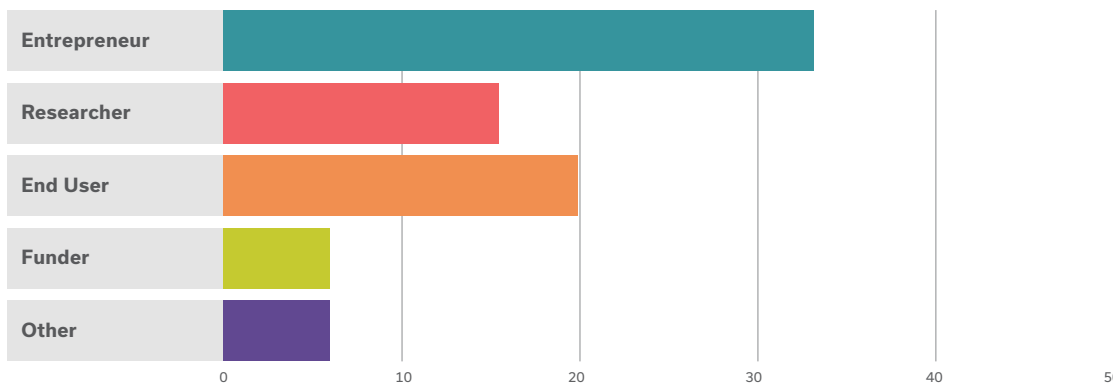
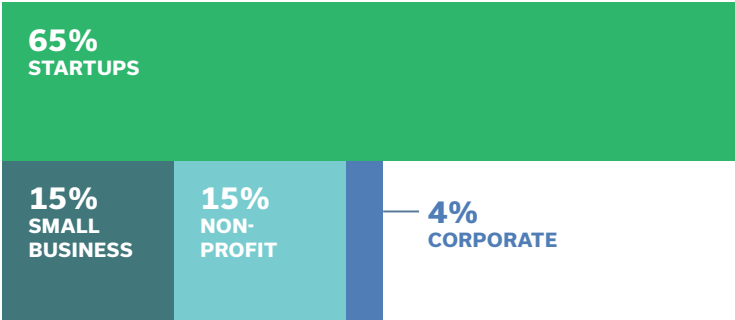


Figure 6: Survey participation categories

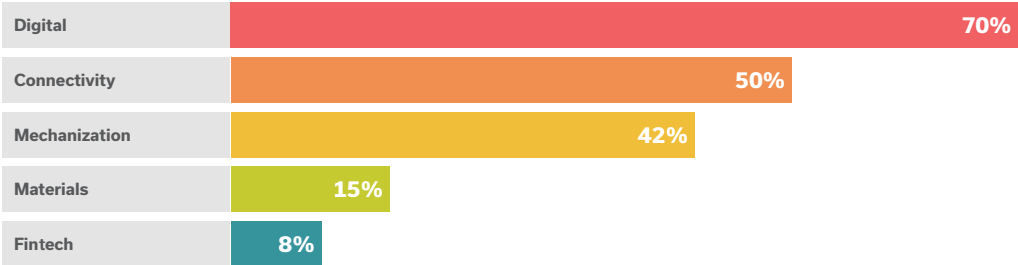
ENTREPRENEUR



In the entrepreneur category, over 65% respondents identified as a 'startup', about 15% identified as a 'small business', 15% identified as a 'non-profit', and 4% identified as 'corporate'.

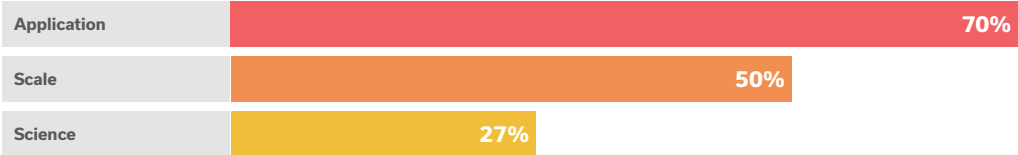
Types of FireTech solutions developed

In terms of types of solutions developed by entrepreneurs, about half of the respondents self-identified under two or more categories, often associated with digital and connectivity, and materials and mechanization.



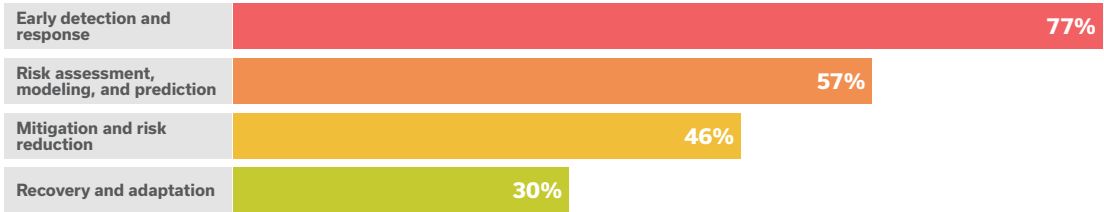
Stage of development

In terms of stage of development, almost 70% of respondents in the entrepreneur category identified their FireTech solution in the 'Application' (pilots and operationalizing) phase, followed by 50% identifying with 'Scale' (new geographies and or verticals), and 27% identifying with 'Science' (research and development). Often, these phases were reported to be overlapping showing that FireTech is an iterative process that requires constant innovation for solutions to be interoperable, even when products are being deployed.



Areas of focus

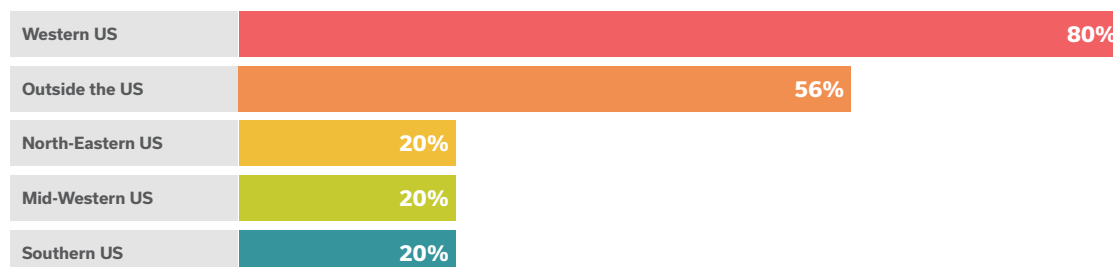
About 77% of respondents in the entrepreneur category are addressing 'Early detection and response', followed by 57% of respondents developing FireTech in the area of 'Risk assessment, modeling, prediction' (includes high-resolution data for mapping fire behavior and human-earth system model, data standardization and integration practices, and Information, communication, and education technologies). About 46% reported a focus on 'Mitigation and risk reduction' (includes utility and asset management, land use planning and management, managing risk in the built environment, and fuel management), and 30% report a focus on recovery and adaptation (includes community resilience and wellbeing, recovery, rebuilding and relocation, wildfire loss and damage data, and reforestation and ecosystem health).



ENTREPRENEUR

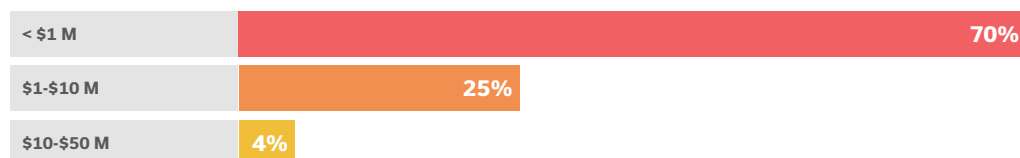
Geographic areas

At 80%, most respondents reported a geographic focus on developing, applying, and scaling FireTech solutions in the western United States. 56% of respondents focus on developing, applying, and scaling FireTech solutions outside the United States. About 20% of the respondents reported working across the North-Eastern United States, Mid-western United States, and Southern United States, respectively.



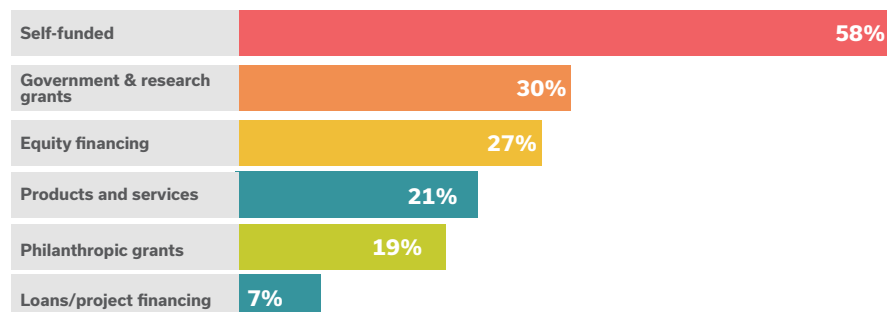
Funds raised

About 70% respondents in the entrepreneur category report raising less than \$1 million total funding to date. About 25% report raising between \$1-10 million total funding to date, and 4% report raising between \$10-50 million total funding to date.



Primary sources of funding

About 58% report being self-funded. About 30% report funding from government grants, including research grants; 27% report equity financing; 19% report philanthropic grants, and just over 7% report loans/ project financing as a primary source of funding. About 27% of the respondents reported under 2 or more categories, often combining equity financing with loan/ project financing, equity financing with government grants, equity financing with philanthropic grants, government and or philanthropic grants with being self-funded.



Annual revenue

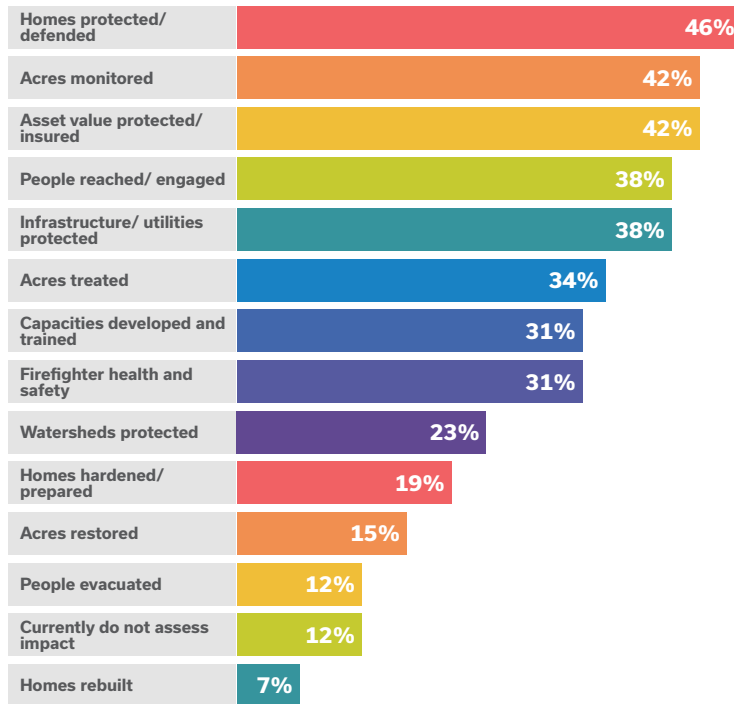
About 76% in the entrepreneur category shared that their current annual revenue is less than \$1 million USD and 24% reported between \$1-10 million USD annual revenue.



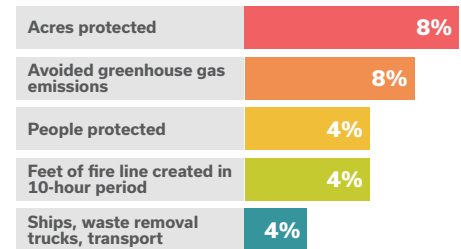
ENTREPRENEUR

Impact metrics

Respondents across the entrepreneur category reported assessing their FireTech solutions' impact along the following impact metrics:

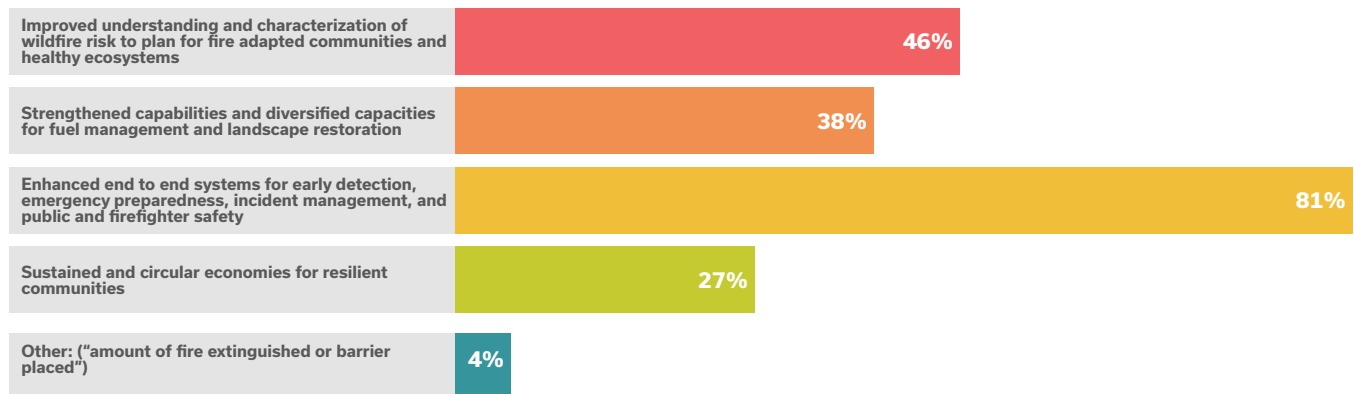


Five respondents identified the following additional areas of impact under 'other':



Outcomes

Respondents in the entrepreneur category seek to enable the following kinds of wildfire risk management outcomes with their FireTech solutions:



Funding availability

About 85% of respondents in the entrepreneur category believe that current funding availability for wildfire risk management technology development and applications is below the perceived need. About 12% believe current funding availability is at perceived need. Under 'other', one respondent shared additional perspective stating they "haven't struggled to raise funding (yet)".



ENTREPRENEUR

Greatest challenge

Respondents across the entrepreneur category, including startups, small businesses, corporate, shared challenges along the following three themes:

1. FUNDING RELATED CHALLENGES

<p>"Servicing our early pilot demonstrations meaningfully because of lack of funding. We do not have the private capital required to take advantage of available government funding."</p>		<p>"Matching with funders who are in all of the following: Seed Funding, Hard Tech, B2G, Climate Tech"</p>	
		<p>"Accessing capital"</p>	<p>"Access to the right capital"</p>
<p>"To access funding for expansion"</p>	<p>"The biggest challenge we face as a non-profit organization supporting hundreds of individuals and organizations across the country is in working with the largest funders & agencies to really understand the on-the-ground needs. Technologies, tools, and resources, MUST be focused on the organizations that carryout the work. These groups are often the smallest, most local, with the least amount of resources - let's start catering to them and see what happens."</p>		<p>"Speed mismatch between what government perceives as fast action and the expectations of private investors."</p>
<p>"Receiving funding"</p>			
<p>"Money for research and development"</p>	<p>"To access funding for expansion"</p>	<p>"Funding, live fire R&D, available manufacturing verse costs and technology visibility/sales force."</p>	<p>Tactically, need to accelerate lobbying at state and federal levels and find well-aligned private capital."</p>

2. TECHNOLOGY DEVELOPMENT CHALLENGES

<p>"Change the actual culture from reaction to prevention. Another fight is to show that high-resolution prediction models work better than global ones. It's better to take action when you have 10 meters of resolution than one with 1 mile per pixel. The prediction models today are just for public policies, not for real action."</p>		<p>"Commercializing open-source modeling"</p>
		<p>"We require near-real conditions to validated successful containment of fire fronts with our equipment. This is only possible in collaboration with public bodies and highly dependent on weather."</p>
<p>"Valid accessible data"</p>		

3. TECHNOLOGY ADOPTION CHALLENGES

<p>"Many of the end users are large companies or government organizations, meaning they're not the typical early adopters of new technical solutions."</p>		<p>"Market awareness and user adoption"</p>	<p>"Customer adoption"</p>
		<p>"Getting early adopters for our products and services"</p>	
		<p>"Education of policy makers on options. Awareness of emerging solutions."</p>	<p>"Getting early adopters for our products and solutions."</p>
<p>"Agency and government adoption of new tech"</p>	<p>"Government adoption"</p>		

Table 2: Summary of survey responses in the Entrepreneur category

ENTITY	FIRETECH	STAGE	AREA OF FOCUS	FUNDS RAISED	SOURCE	ANNUAL REVENUE (USD)
Startup	Mechanization	Application	Early detection & response	<1 M	Self-funded	<\$1 M
	Digital, Connectivity	Application Scale	Early detection & response	<1 M	Equity financing, Loan/ project financing	<\$1 M
	Digital, Mechanization	Application	Early detection & response	\$1-10 M	Equity financing, Philanthropic grants	<\$1 M
	Connectivity	Application	Early detection & response	\$1-10 M	Equity financing, Government grants	<\$1 M
	Digital	Science	Risk assessment	<\$1 M	Self-funded	<\$1 M
	Digital	Science Application	Risk assessment, Mitigation & risk reduction, Early detection & response	<\$1 M	Self-funded	<\$1 M
	Mechanization	Application	Early detection & response	<\$1 M	Equity financing	<\$1 M
	Digital, Connectivity	Scale	Risk assessment, Mitigation & risk reduction, Early detection & response	<\$1 M	Self-funded, Loan/ project financing	\$1-10 M
	Mechanization	Science, Application	Mitigation & risk reduction, Early detection & response	<\$1 M	Self-funded	<\$1 M
	Digital	Scale	Risk assessment, Mitigation & risk reduction, Recovery & adaptation	<\$1 M	Self-funded	<\$1 M
	Mechanization, Materials	Scale	Fire suppression	<\$1 M	Self-funded	<\$1 M
	Digital, Mechanization, Materials	Application Scale	Risk assessment, Mitigation & risk reduction, Early detection & response, Recovery & adaptation	<\$1 M	Government grants, Self-funded, Products and services	<\$1 M
	Other; Hardware	Science	Early detection & response	Not reported	Self-funded, Research grants	<\$1 M
	Digital, Connectivity	Application	Risk assessment, Early detection & response	\$10-50 M	Equity financing	\$1-10 M
	Digital	Science	Risk assessment, Early detection & response	<\$1 M	Self-funded	<\$1 M
	Digital	Scale	Risk assessment	<\$1 M	Equity financing	\$1-10 M
Mechanization	Application	Mitigation & risk reduction	<\$1-10 M	Equity financing, Philanthropic grants	\$1-10 M	

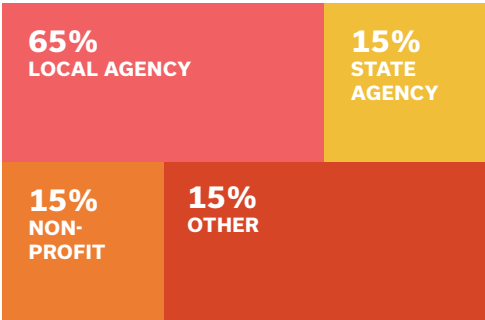
ENTREPRENEUR

ENTITY	FIRETECH	STAGE	AREA OF FOCUS	FUNDS RAISED	SOURCE	ANNUAL REVENUE (USD)
Small business	Digital	Application	Early detection & response	<\$1 M	Self-funded	<\$1 M
	Digital	Science Application Scale	Risk assessment Mitigation & risk reduction, Early detection & response, Recovery & adaptation	\$1-10 M	Government grants, Philanthropic grants, Self-funded, Product and services revenue	\$1-10 M
	Digital, Mechanization	Application Scale	Risk assessment, Early detection & response, Recovery & adaptation	<\$1 M	Self-funded, Products and services	<\$1 M
	Connectivity	Application Scale	Early detection & response, Recovery & adaptation	<\$1 M	Self-funded	\$1-10 M

ENTITY	FIRETECH	STAGE	AREA OF FOCUS	FUNDS RAISED	SOURCE	ANNUAL REVENUE (USD)
Non-profit	Digital	Scale	Early detection & response	\$1-10 M	Philanthropy, Self-funded, Products and services	<\$1 M
	Digital, Mechanization, Materials, Fintech	Application Scale	Risk assessment, Mitigation & risk reduction	\$1-10 M	Government grants	Not reported
	Digital, Mechanization, Materials	Application Scale	Risk assessment, Mitigation & risk reduction, Early detection & response, Recovery & adaptation	<\$1 M	Government grants, Philanthropic grants	<\$1 M
	Digital, Connectivity	Application, Scale	Risk assessment, Mitigation & risk reduction, Early detection & response	Not reported	Government grants, Philanthropic grants, Products and services	Not reported

ENTITY	FIRETECH	STAGE	AREA OF FOCUS	FUNDS RAISED	SOURCE	ANNUAL REVENUE (USD)
Corporate	Digital Connectivity	Application	Risk assessment, Mitigation & risk reduction, Early detection & response, Recovery & adaptation	<\$1 M	Government grants	<\$1 M

RESEARCHER & END USER



Of the responses received under the researcher category, only one set was complete and identified as 'consultant'. Of the complete responses received in the end user category, 1 identified as a state agency, 2 identified as local agencies, 1 identified as a non-profit, and 2 identified as consultants to NGOs and CBOs (also see Table 3 for a summary of survey responses received in the researcher and end user categories). Given the overlaps reported across these categories, the issues highlighted in this section's summary should be noted in addition to the issues already highlighted under the entrepreneur category in the previous section.

Areas of focus

In the researcher category, the one complete response indicates a focus on mitigation and risk reduction. Most respondents in the end user category report a focus on adopting 'mitigation and risk reduction' technologies (83%) and 'risk assessment, modeling, prediction (83%)', followed by 'early detection and response' (66%), and 'recovery and adaptation' technologies (50%).



FireTech solutions

83% respondents in the end user category reported deploying Connectivity solutions, followed by 66% reporting adoption of Digital solutions. Only 16% reported deploying Mechanization and FinTech solutions respectively. If current funding and capacity barriers are addressed, most respondents in the end user category report wanting to further explore Mechanization solutions.



Geographic areas

Most end users (80%) reported deploying FireTech solutions in the Western United States, specifically, California. One end user reported deploying outside the United States--in Queensland, Australia.



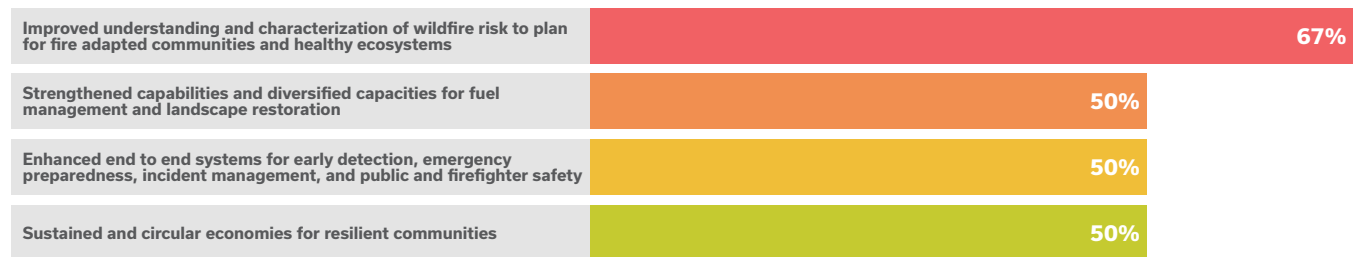
RESEARCHER & END USER

Stage of application

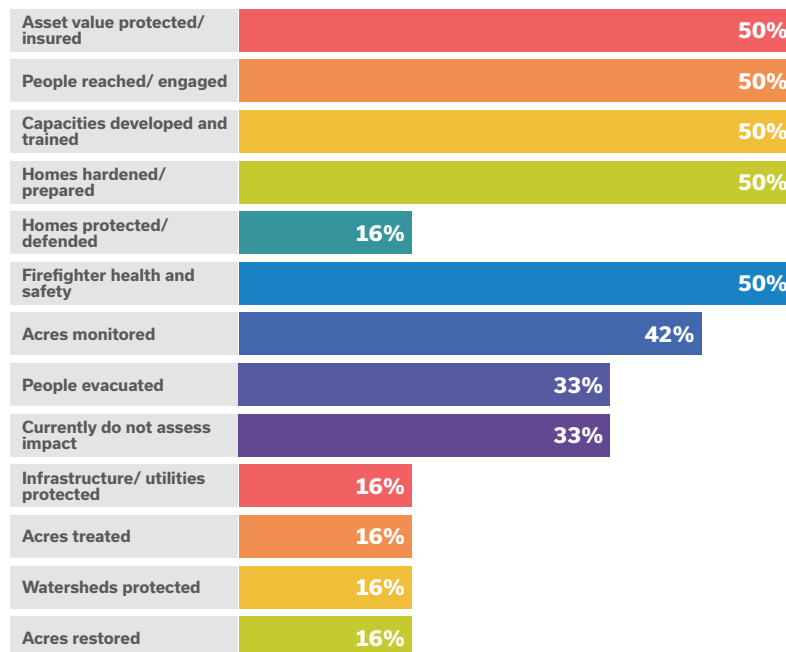
All end users reported it most useful to deploy FireTech solutions at the stage of application (pilots and operational). 31% report also engaging with FireTech solutions at the science (research and development) stage.



Outcomes



Impacts assessed



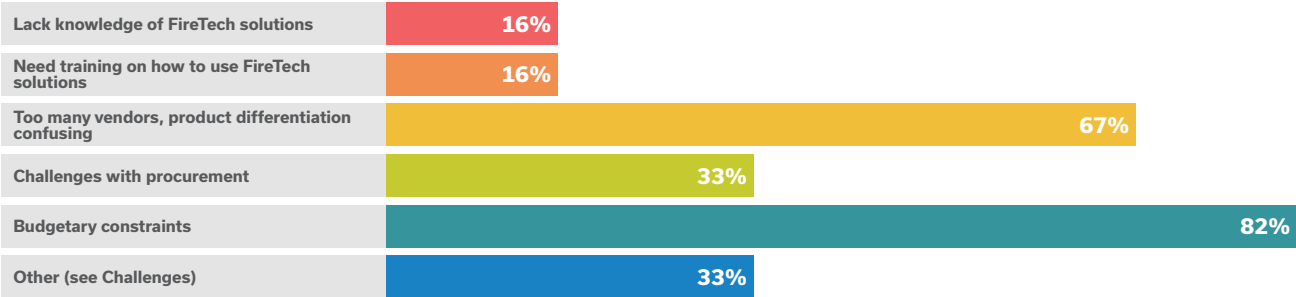
Funding availability

Across the researcher and end user categories, most respondents reported funding availability 'below' perceived need and 33% reported funding availability 'at' perceived need.



RESEARCHER & END USER

Barriers to deploying FireTech



Challenges

Comments in 'other'

<p>“Too many options and many are fly-by-night, so difficult to assess what’s really useful”</p>	<p>“Procurement/ ICT policy space – the “safeguards” prevent meaningful engagement and the ability to engage with creators in ideation and development of solutions that solve the problems of consequence”</p>	
<p>“The wildland firefighting culture”</p>	<p>“Helping our community groups develop and consolidate projects for funding assistance”</p>	<p>“Staffing and related funding”</p>
<p>“New tech takes a lot of understanding and comprehension on how to use, ease of use, and best application. With numerous different solutions with separate log-ins, silo of information and data and “just another app”</p>		



RESEARCHER & END USER

Table 3: Summary of survey responses in the Researcher and End User categories

ENTITY	FIRETECH SOLUTION	AREAS OF FOCUS	STAGE OF DEVELOPMENT	FUNDING (USD)	OUTCOMES TRACKED	IMPACTS ASSESSED
Researcher (Aviation Consultant, United States)	'Other' selected: "Pragmatic FireTech development, assessment and integration strategies for Federal Agencies".	Mitigation and risk reduction	Application (pilots and operationalizing)	Available funding is below perceived need.	Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	Acres monitored, Acres treated, Watersheds protected, Homes hardened/ prepared, Infrastructure/ utilities protected Asset value protected/ insured
End user (Consultant, Western United States)	Digital	Risk assessment, modeling, prediction	Application (pilots and operationalizing)	Available funding is below perceived need.	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems.	Currently do not assess impact
End user (Consultant, Western United States)	Digital Connectivity	Mitigation and risk reduction Risk assessment, modeling, prediction Recovery and adaptation	Application (pilots and operationalizing)	Available funding is below perceived need.	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Sustained and circular economies for resilient communities.	Acres treated Acres restored Watersheds protected People reached/ engaged Homes hardened/ prepared Asset value protected/ insured Capacities developed/ trained
End user (Non-profit, California)	Connectivity FinTech	Mitigation and risk reduction Early detection and response Recovery and adaptation	Application	Organization's funding is at perceived need.	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Sustained and circular economies for resilient communities.	Currently do not assess impact

RESEARCHER & END USER

ENTITY	FIRETECH SOLUTION	AREAS OF FOCUS	STAGE OF DEVELOPMENT	FUNDING (USD)	OUTCOMES TRACKED	IMPACTS ASSESSED
End user (Local agency, California)	Connectivity	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response Recovery and adaptation	Application	Organization's funding is at perceived need.	Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	People evacuated Homes hardened/ prepared Firefighter health and safety
End user (Local agency, California)	Digital Mechanization Connectivity	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response	Science Application	Organization's funding is below perceived need.	Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	People reached/ engaged Homes hardened/ prepared Homes protected/ defended Infrastructure/ utilities protected Asset value protected/ insured Capacities developed/ trained Firefighter health and safety
End user (State agency, Australia)	Digital Connectivity	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response Recovery and adaptation	Science Application	Organization's funding is below perceived need.	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety. Sustained and circular economies for resilient communities.	People reached/ engaged People evacuated Asset value protected/ insured Capacities developed/ trained Firefighter health and safety

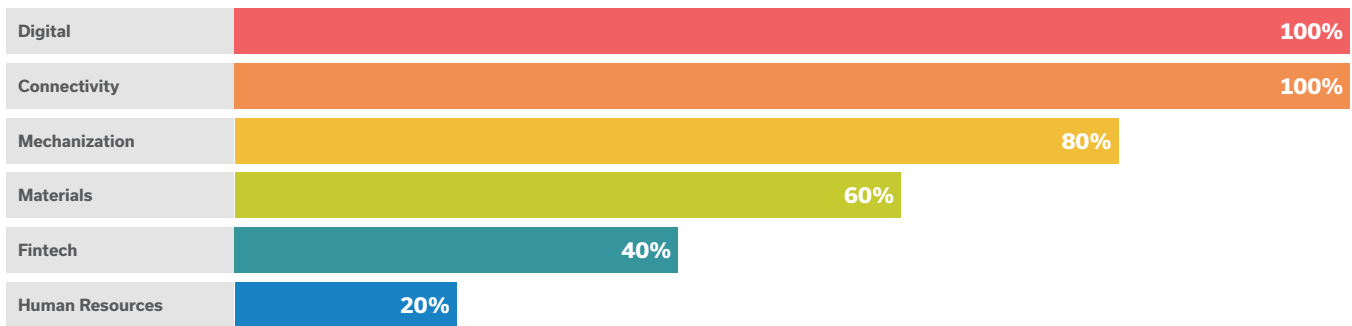
FUNDER



In the funder category, a total of five responses were received from the following funding entities.

FireTech solutions

In the funders category, all respondents reported funding digital (data, analytics, modeling, A.I., Saas) and Connectivity (sensing, detection, communications). 80% currently support mechanization (machines, robotics, drones, automation, tools). 60% support materials (compounds, retrofits), 40% support FinTech (insurance, bonds, carbon economics), and 20% support human resources training and development.



Areas of focus

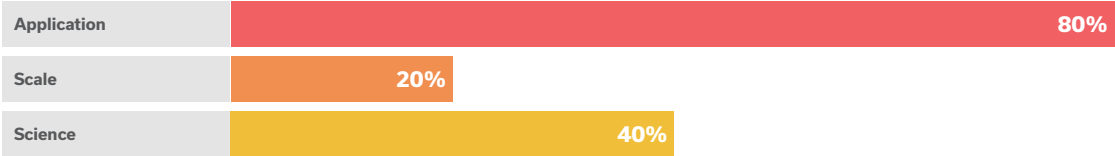
All respondents in the funder category report a focus on funding 'risk assessment, modeling, and prediction' technologies (100%), followed by an equal focus on 'mitigation and risk reduction' (80%) and 'early detection and response' (80%) and lastly, on 'recovery and adaptation' technologies (60%). Responses were also received under 'Other', including: science and traditional knowledge-informed understanding, improved measurement and evaluation of wildfire resilience outcomes, fostering conditions (policy, advocacy) to accelerate and sustain solutions.



FUNDER

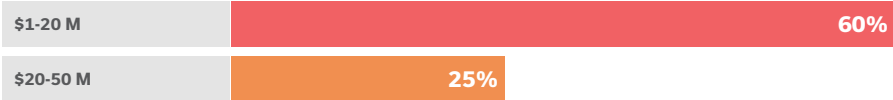
Stage of funding

80% of respondents in the funders category report supporting projects at the applications stage (pilots and operationalizing). 40% of the respondents support science (research and development), and 20% support projects to scale (new geographies and verticals).



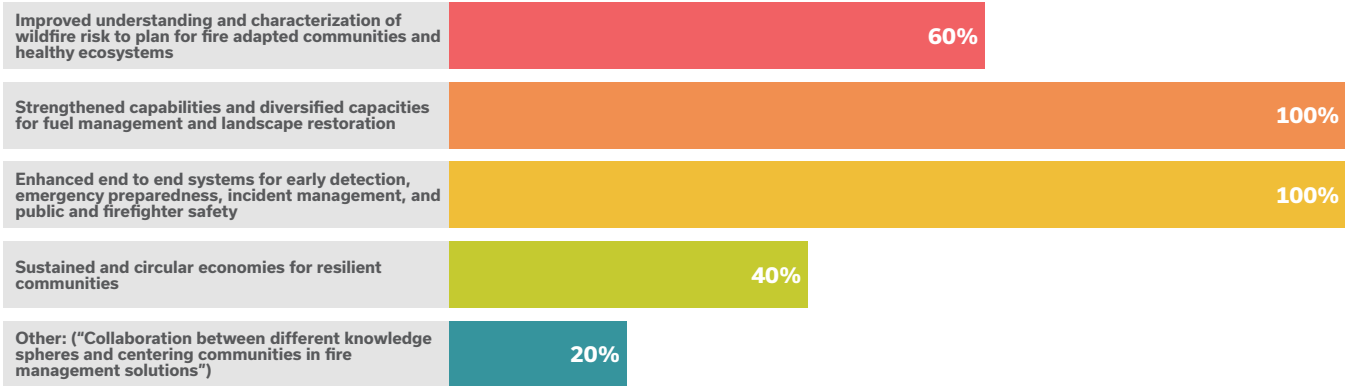
Funding size

In 2023 alone, 60% of respondents in the funders category have earmarked \$1-20 million for FireTech and 25% have committed between \$20-50 million. These commitments do not indicate actual spending/ giving for the year.



Outcomes

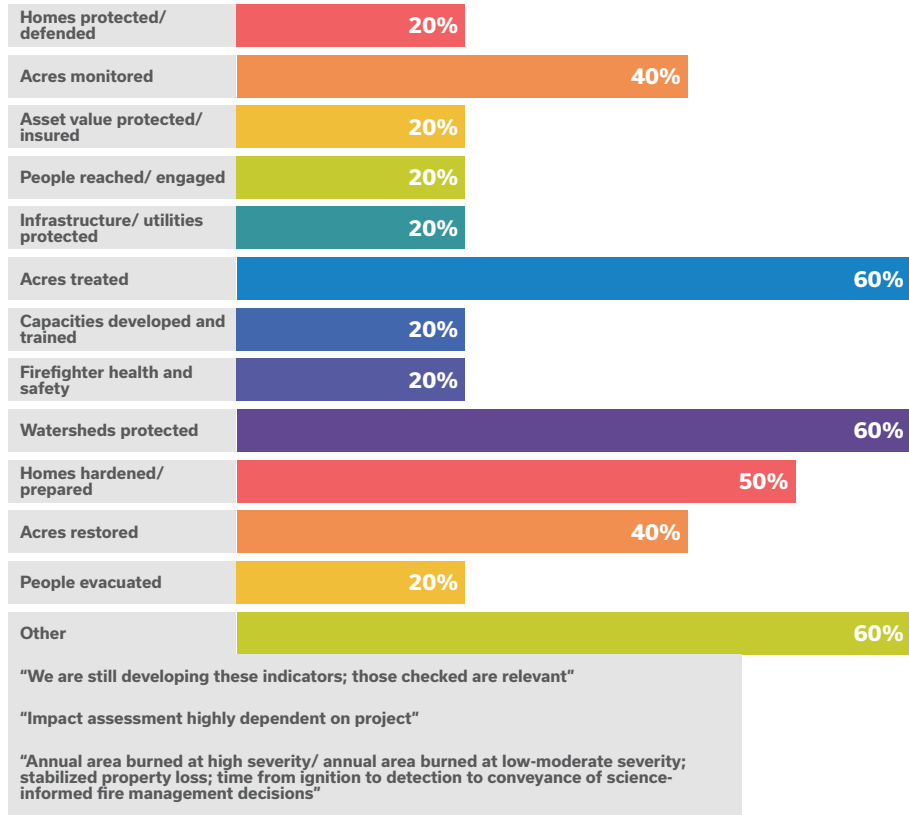
Funders seek to enable the following kinds of wildfire risk management outcomes:



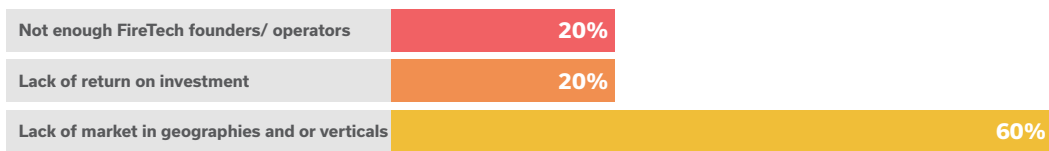
FUNDER

Impacts

Funders assess their FireTech funding impacts along the following metrics:



Barriers to funding scalable FireTech solutions



Barriers

Comments in ‘other’

“Capital requirements and stickiness in public funding”

“Valley of death between good ideas and scaled adoption; lots of noise”

FUNDER

Current spending: Government

At 80%, most funders believe current government spending on FireTech development and applications is below the perceived need. Also, a reflection was shared that there is “not a lack of funding but lack of capacity of government infrastructure to efficiently and effectively disburse funds / distribute funding”.



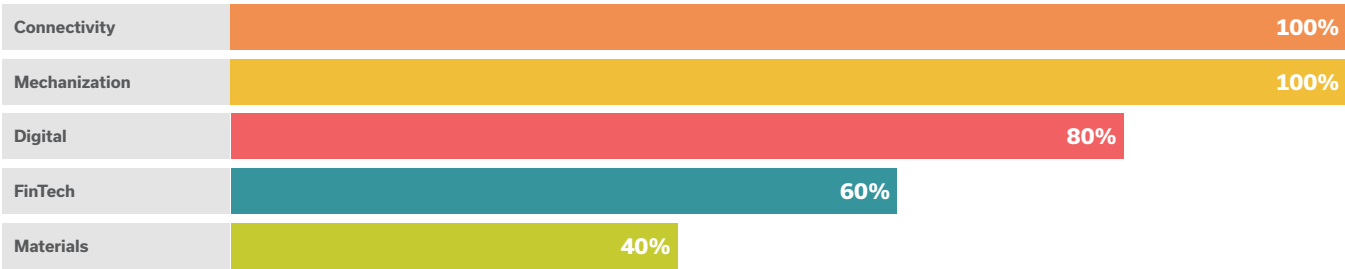
Current spending: Private and Philanthropic

All respondents unanimously believe that current private and philanthropic funding for FireTech development and applications is below the perceived need.



Funding forecast for future FireTech solutions

Funders responding to this survey are most likely to fund more of the following kinds of FireTech solutions in the years ahead:



FUNDER

Table 4: Summary of survey responses in the Funder category

FUNDER TYPE	FIRETECH	AREAS OF FOCUS	STAGE OF DEVELOPMENT	FUNDING (USD)	OUTCOMES TRACKED	IMPACTS ASSESSED
Private family foundation	Digital Connectivity	Risk assessment, modeling, prediction	Science Application	\$1-20 m	Strengthened capabilities and diversified capacities for fuel management and landscape restoration, Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	Acres treated Acres restored Watersheds protected People evacuated
Private family foundation	Digital Connectivity Mechanization Other: Human resources training and development	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response	No response	No response	Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	"Impact assessment highly dependent on project"
Private family foundation	Digital Mechanization Materials Connectivity FinTech	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response Recovery and adaptation Other: Science and traditional knowledge-informed understanding; improved measurement and evaluation of wildfire resilience outcomes; fostering conditions (policy, advocacy, etc) to accelerate and sustain solutions	Science Application Scale	\$1-20m	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety.	Watersheds protected Homes protected/defended Infrastructure/ utilities protected Other (please specify): Annual area burned at high severity/ annual area burned at low-moderate severity; stabilized property loss; time from ignition to detection to conveyance of science-informed fire management decisions

FUNDER

FUNDER TYPE	FIRETECH	AREAS OF FOCUS	STAGE OF DEVELOPMENT	FUNDING (USD)	OUTCOMES TRACKED	IMPACTS ASSESSED
Venture capital	Digital Mechanization Materials Connectivity FinTech	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response Recovery and adaptation	Application	\$20-50m	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety. Sustained and circular economies for resilient communities.	Acres monitored Acres treated Asset value protected/ insured
Re-granting or collaborative funding institution	Digital Mechanization Materials Connectivity	Mitigation and risk reduction Risk assessment, modeling, prediction Early detection and response Recovery and adaptation	Application	<3 m	Improved understanding and characterization of wildfire risk to plan for fire adapted communities and healthy ecosystems. Strengthened capabilities and diversified capacities for fuel management and landscape restoration. Enhanced end to end systems for early detection, emergency preparedness, incident management, and public and firefighter safety. Sustained and circular economies for resilient communities. Other (please specify): Collaboration between different knowledge spheres and centering communities in fire management solutions.	Acres monitored Acres treated Acres restored Watersheds protected People reached/ engaged Capacities developed/ trained Firefighter health and safety

Endnotes

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