VEFAMUN'25
ECOFIN STUDY GUIDE

Discussing the economic consequences of wildfires on a global scale

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1. Letter from Secretary-General

Most Special Participants of VefaMUN'25,

It is I, Cansu Solmaz Hurşitoğlu, an 11th grader at Vefa High School. As the Secretary-General of VefaMUN'25, it is my utmost pleasure to welcome you all to the 6th edition of VefaMUN.

I can confidently say that our academic and organization teams have poured their hearts into ensuring that VefaMUN'25 excels in every aspect. We endured sleepless nights, moments of stress, and countless challenges, but in the end, we have created something truly exceptional.

All of our team members burned the candle at both ends, which brings us to today: the best version of ourselves.

We have meticulously designed each committee to provide an enriching academic experience. I have no doubt that you will have an unforgettable time with eight committees, all carefully crafted for your engagement.

I have been taking great care of this heirloom ever since I started carrying it, and I invite you to join our conference as our family.
Welcome once again!

Warmest Regards,
Cansu Solmaz Hurşitoğlu
Secretary-General of VefaMUN'25

2. Letter from Under-Secretary-General

Dear Delegates and Esteemed Participants,

I am Gülnihal Sarı from Kartal Anatolian Imam Hatip School and a 10th grader. Currently, I am studying the IBDP, so it was a great opportunity for me to explore more about our planet and nature. ECOFIN is one of the oldest configurations of the Council of the European Union. Wildfires and their economic impact on ourselves, member states, the planet, the ecosystem, etc., will be discussed in this committee. My Academic Assistant Nisa and I had an amazing journey to present the best version of the ECOFIN committee. I cannot underestimate her effort, and I was honoured to work with her. This committee aims to develop your ability in collaboration, discussion, and problem-solving skills. I hope each of you, my delegates, will make this process one of your greatest MUN experiences. So, tighten your belt and just wait for VEFAMUN'25.

If you have any questions regarding committee and agenda items, you can contact me via my email address => gulnihalsari@icloud.com

Gülnihal Sarı
Under-Secretary General

3. Introduction to the Committee

The Economic and Financial Affairs Council, also known as ECOFIN, is the Second United Nations Committee and a key body for addressing global economic and financial issues. It is responsible for solving problems such as the economy, inflation, and unemployment that arise in interconnected system movements in the most urgent way and with the least loss rate. ECOFIN works intensively to solve problems such as economic inequality and agricultural development in line with its active development, financing, and poverty eradication goals. In line with this goal, sustainable development ensures that citizens around the world have the necessary institutions to develop economically and financially.

The ECOFIN Committee aims and focuses on the following policies:

- Analyzing pressing global economic challenges.
- Developing collaborative solutions that consider various national interests.
- Navigating the difficulties of international financial systems and development agendas.
- Understanding the global economic dynamics and improving their skills in negotiation, policy analysis, and international diplomacy. of

ECOFIN aims to support current economic issues while promoting a fair global economy that encourages long-term peace and growth. The committee plays a vital role in creating a more sustainable and peaceful world by encouraging collaboration and developing policy ideas. As the delegates are gathering to discuss the items on the agenda, the ECOFIN Committee would like to underline that it remains committed to drafting solutions that can be implemented and that are needed not only for these very challenges but also for applying the right foundations for a fair and strong world economy.

4. Introduction to the Agenda Item: Discussing the Economic Consequences of Wildfires on a Global Scale

Wildfires have become well-known and have been seriously damaging to the global environment and economy. In recent years, the frequency, power, and geographic reach of wildfires have risen and worsened due to climate change, deforestation, and human activity. It brought devastating effects on the environment and nature, and even on national and global economies. As climate change increases, regions such as North and South America, Australia, Europe, and Africa are experiencing unusual levels of wildfire activity. These fires break crucial economic sectors, they lead to billions of dollars in damages while creating long-lasting impacts on development, infrastructure, and public health.

The economic impact of wildfires is a significant topic. They cause direct harm to homes, roads, infrastructure, and natural resources. In addition to these direct effects, there are also indirect costs that communities face, like the loss of productivity, less tourism, and higher healthcare expenses. In order to support affected areas and promote recovery, addressing these challenges is crucial.

Wildfires damage the agricultural sector often by destroying crops and livestock, causing food poverty and market instability. Besides, forests, which provide a major carbon source and contribute to local economies, are being destroyed. This damage is affecting the environment and forcing rural communities that depend on forestry to find new ways to make a living in the long term.

Furthermore, the cost of wildfire suppression, recovery, and rehabilitation places a heavy financial burden on governments. Countries are being forced to provide funds from their budgets instead of other crucial areas in order to combat the effects of wildfires, wasting national resources. As a result of forest fires disturbing production and exports in agriculture, energy and tourism sectors, side effects such as international trade, global supply chains, and market stability arise.

To address the economic consequences of wildfires, a collaborative global effort is needed. The ECOFIN committee is responsible for discussing creative, sustainable solutions, such as policy measures, financial mechanisms, and international cooperation to reduce the economic consequences of wildfires. Exploring solutions that emphasize resilience building, sustainable land management methods, and climate adaptation to reduce the frequency and force of wildfires is a must for the committee while ensuring that affected communities receive the support they need for economic recovery.

As delegates begin to discuss the agenda of this committee, it is essential to consider how wildfires affect the globe. They can cause immediate economic damages and have long-term financial effects. ECOFIN will discuss possible financial mechanisms to reduce the risks

caused by wildfires, such as disaster relief funds, financial aid mechanisms, and green investment actions. As the committee reflects on the economic consequences of wildfires worldwide and finds solutions to help develop the economy, our goal is to promote global collaboration to find solutions that address the economic damage while promoting sustainable solutions to prevent their occurrence.

5. Key Terms and Definitions

Wildfire: A huge fire that spreads quickly and burns natural areas like woods, forests, and grassland. These fires can spread quickly due to environmental factors like wind, temperature, and dryness. It can cause significant environmental and economic damage.

Economic Consequences: The financial impacts of an event, in this case, wildfires. These include direct costs such as damage to infrastructure and property, and indirect costs like lost productivity, unemployment, and recovery expenses.

Climate Change: The long-term changes in the Earth's climate, specifically the increase in the temperature of the atmosphere that is caused by the increase of different gases, mainly carbon dioxide. Climate change is related to human activities like carbon emissions. It is a major factor contributing to the increased frequency of wildfires.

Deforestation: The act of cutting down or burning trees and forests in an area, which causes biodiversity loss, changes ecosystems, and contributes to climate change. It can also increase the possibility of wildfires due to drought conditions and the loss of natural firebreaks.

Insurance Costs: Wildfires cause significant financial challenges for insurance companies and policyholders. These challenges include claims for property damage, interruptions to business operations, and other losses related to the fire.

Disruption: A situation in which it is difficult for something to continue in the normal way; the act of stopping something from continuing as usual or as expected.

Sustainable Land Management: Adapting to the local climate and environment while protecting resources, reducing waste, and preventing air, water, and soil pollution. It refers to avoiding and minimizing the use of chemicals by focusing on improving soil and ecosystem health to resist disease and insects.

Infrastructure Damage: Refers to the harm or ruin of essential physical structures and facilities that support a society's economy and quality of life, including transportation systems, utilities, communication networks, and public services.

Financial Strain: Financial strain refers to the pressure caused by economic difficulties, which can lead to governments being unable to meet the needs and expectations of their citizens, potentially resulting in social unrest and political instability.

6. General Overview

6.1. Introduction to Wildfires and Their Global Impact

6.1.1. Definition and Causes of Wildfires

Fire could be meant to lighten our homes, heat our meals and warm our baths; however, the fires occurring in nature may lead to a disaster which is called a wildfire. Wildfires are uncontrolled fires that typically occur in rural areas and burn wildland vegetation. Forests, grasslands, savannas, and other ecosystems can all experience wildfires. They are not restricted to a specific type of plant or area.

6.1.2. Underlying Reasons of Wildfires:

According to CNN, 95% of wildfires are caused by people. Meteorologists are not yet able to explain the outbreak of wildfires. However, 3 conditions are required for a wildfire to become possible: fuel, oxygen, and heat resources. Four out of five fires are started by people.

- However, strong winds, dry weather, and drought can combine to produce the ideal catastrophe, turning a spark into a fire that burns for weeks or months and engulfs tens of thousands of acres.
- Another possible reason for wildfires is lightning. Since 1975 the number of fires ignited by lightning has increased between two and five per cent.
- Climate change is the biggest reason behind lightning storms and wildfires. The land surface warms during longer and warmer summers. Together with rising carbon emissions, this results in greater updrafts, which raise the likelihood of more frequent and intense lightning. According to a 2014 study, for every degree Celsius that the temperature rises, the probability of lightning strikes increases by 12%.

For instance, 60% of the wildfires in British Columbia, Canada, occur as a result of hot lightning on an average yearly basis. Lightning storms also contributed to the deadly and historic 2020 Bay Area fire, which devastated 5 million acres of land, over 10,000 structures, and claimed 33 lives.

- Fuel is one of the three components needed for wildfires to start. This frequently arises as dry vegetation. Elevated temperature and low wintertime precipitation often leave vegetation primed for wildfires.
- Intentionally or unintentionally, humans are also responsible for initiating wildfires. Human activities such as campfires; equipment failure and the malfunction of engines due to debris burning; negligent discarding of cigarettes on dry grounds; as well as other intentional acts of arson.

6.1.3. Advantages and Harms of Wildfires

Surprisingly, wildfires are essential for the continued survival of some plant species. Some tree cones, for instance, require heating in order to open and release their seeds; chaparral species, such as scrub oak (Quercus berberidifolia), manzanita, and chamise (Adenostoma fasciculatum), require fire in order for their seeds to germinate. The leaves of these plants include a flammable resin inside themselves that feeds the fires, helping the plants to propagate.

Wildfires also help keep ecosystems healthy. They can kill insects and diseases that harm trees. By destroying underbrush and shrubland, fires can create new grasses, herbs and shrubs that provide food and habitat for animals and birds. At low intensity underbrush may clean up debris and underbrush on the forest floor and add nutrients to soil to set a space to let sunlight through the ground. That sunlight can nourish larger plants and give larger trees an area to grow.

Indeed these fires are meant to help the ecosystem to keep healthier; however, suppression of naturally occurring, low-intensity forest fires has hurt the ability of high-intensity wildfires to get wild.

6.1.4. Human-Induced Wildfires

Humans are another factor that triggers the initiation of wildfires, either accidentally or intentionally. In addition, human-related events that can ignite wildfires range from open burning, such as campfires, to engine failure resulting in the burning of debris and equipment failures. Then negligent discarding of cigarettes and throwing them at green areas, as well as other international acts of arson. Also, the government resources announced that 40% of wildfires that affect British Columbia in an average year are unfortunately caused by human events. However, it is double the amount of British Columbia, with nearly 85% of the approximately 100,000 wildland fires that can affect North America every year caused by human activities. Another source of data obtained is the National Park Service, which recalled that man-made fires have tripled the length of North America's fire seasons between

1992 and 2012, from 46 to 154 days. It is understood that the major causes of wildfires were debris burning and arson, while campfires and fireworks were responsible for 5% of fires after an over 21-year study period. Furthermore, human-induced wildfires are more destructive and extreme than nature-induced ones, as they move more than twice as fast, spreading about 1.83 kilometers per day.

6.1.5. The Effects of Wildfires on Humans

According to estimates, wildfire smoke kills 339,000 people annually, primarily in Asia and sub-Saharan Africa. There have also been reports of tenfold increases in hospital admissions, ER visits, and asthma attacks when smoke permeates residential areas.

Fires can produce inversions, which are layers of stagnant air that hold smoke down where people breathe. These are common in regions like the western United States. Airborne, minute particles can start to coagulate the blood, creating a thick sludge, if they manage to get past the body's defenses and into the pulmonary system's furthest reaches. Carbon monoxide, another substance found in smoke, damages the heart over time.

According to EPA researchers, after the smokiest days of a large 2008 peat fire in eastern North Carolina, ER visits for respiratory issues increased by 66% and visits for heart failure increased by 37%. According to estimates, wildfire smoke kills 339,000 people annually, primarily in Asia and sub-Saharan Africa. There have also been reports of tenfold increases in hospital admissions, ER visits, and asthma attacks when smoke permeates residential areas.

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6.2. Direct Economic Consequences of Wildfires

6.2.1. Infrastructure Damage

As demonstrated in Table 1 data, wildfires may go beyond the immediate direct effect, and damages also may spread through various parts of the communities affected by the indirect incidences and through indirect losses, which have adverse social impacts. Wildfires can have major economic and social impacts; over 46 million homes in 70,000 urban, suburban, and native communities are at risk of wildfires in the US alone. For instance, the losses due to

wildfires continue to increase annually. This gradual increase has also been observed in the past years in countries which are Greece, Portugal, and Canada, and most recently in Australia. One fact that should be kept in mind is that in a severe wildfire in fire season, wildfires can destroy thousands of structures, for example, le 10,488 buildings in the 2020 California wildfires and 5,900 buildings in the 2020 Australian bushfires. While the average insurance loss due to wildfires in the US is about $3.5 billion (as noted in the last twenty years), furthermore, the overall losses may exceed $20 billion per wildfire incident.

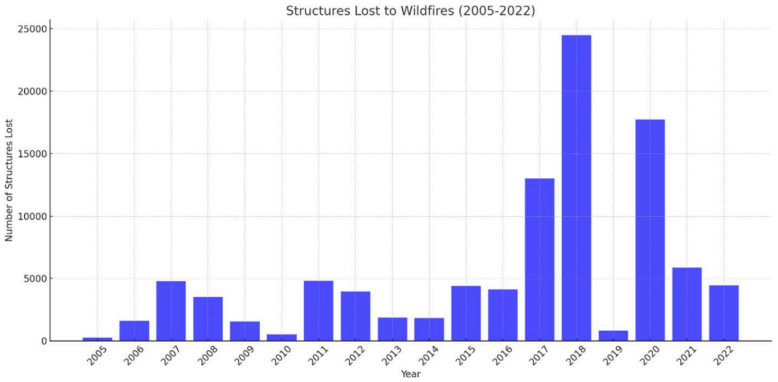


Fig. 1 Number of structures lost to wildfire in the US (Barret 2023)

The underlying reasons that lead to lost of structures in wildfires are aforementioned in the first part of our Study Guide, besides there is another reason that ignites the destruction of structures; Urban planning and building cost. These are crucial components of the design construction process and sustainibility.So there are two key factors that play the key role to determine the vulnerability of structures during the wildfires events.

The place of structures about vegetation is central to speculating how embers or wildfires may reach such developments. Buildings surrounded by dense vegetation are more vulnerable since their proximity makes it easier for flames, embers, radiant heat, and direct flames to spread to neighboring structures. By enforcing buffer space laws, proper urban planning can reduce this risk. These surveys prescribe clearing the vegetation for a certain distance around structures, also creating a buffer zone that slows down or halts the progress of fires. Instead of reducing the chance of wildfires spreading to structures, such buffering provides a safer environment and ecosystem for those who combat wildfires.

Furthermore, the choice of materials and architectural designs can determine a structure's survivability during wildfire events. Because of its viability, some materials that promote more viability than other materials, such as wood, can take precedence over other non-combustible materials. Fire-resistant materials, such as metal roofing, tempered glass, and non-combustible siding, have been made available by developments in building sciences. Through advances like composite systems, enhanced coatings, and modular designs that improve durability and heat resistance, these materials can be incorporated into contemporary buildings. For instance, intumescent coatings can lessen structural damage and slow the spread of flames by expanding when heated to provide protective barriers. Aerogels that are lightweight and porous can also be used to improve insulation while preserving fire resistance. Engineered wood that is resistant to fire and treated with chemicals like borate

enhances fire performance and preserves structural integrity in hot conditions. Improved load-bearing capacity and resistance to heat deterioration are two benefits of advanced composite systems.

Incorporating these materials may also enhance the resistance to wildfires. However, the designs that reduce gaps and minimise the openings may constrain the risk of ignition. Decks and eaves can catch embers and transform into channels that aim fire at the main building. For example, these elements need to be properly detailed. Specific building code provisions with mitigation strategies for overcoming wildfire catastrophes can moderate the usage of construction materials. Lands prone to wildfires benefit from these codes.

Table 1 (continued)

Name	Year	Summary	Structures loss
The Northern California firestorm (O'Neill et al. 2021)	2017	This wildfire converged several wildfires and burned about 345,000 acres. These fires were considered the costliest at the time, causing around $14.5 billion (2017 USD) in damages, including $11 billion in insured losses, $1.5 billion in fire suppression costs, and 44 deaths	8,900 structures
The Carr fire (California) (Lareau et al. 2018)	2018	This wildfire started due to sparks from a vehicle's tire failure. This fire burned more than 220,000 acres and led to the evacuation of 38,000 individuals. This fire cost $1.6 billion	1,604 structures
The Oregon wildfires (Abatzoglou et al. 2021)	2020	This wildfire burned over 1,200,000 acres and led to the evacuation of 40,000 individuals. Many of these fires were triggered by human action and/or lighting	3,000 structures
The Calf Canyon/Hermits Peak fire (New Mexico) (Bachmeier 2022)	2022	Triggered by dry summer and drought conditions, it burned over 340,000 acres. As its name implies, this wildfire converged into two separate wildfires that were caused by losing control of a prescribed burn and re-ignition of an improperly extinguished pile	900 structures (and threatened over 12,000 others)
The Canadian wildfires (Parisien et al. 2023)	2023	This is a collection of wildfires that broke in 2023, burned 41.92 million acres, and caused the evacuation of over 150,000 individuals. Most fires were initiated via lightning	More than 500 structures
The Portugal wildfires (Research and 2018 n.d.)	2017	The wildfires broke out due to the rising high temperatures and thunderstorms. These fires resulted in 66 fatalities and cost EUR 1.5 billion	About 500 structures
The Black Saturday Bushfires	2009	High temperatures, prolonged drought, and gusty winds triggered these bushfires. These fires destroyed 2,000 homes and cost close to $4.4 Billion	More than 2,000 structures
The Maui wildfires (Hawai) (Marris 2023)	2023	Gusting winds from Hurricane Dora, which passed the Hawaiian Islands, blew the wildfire. Evacuation routes were blocked by smoke and heat. The death toll from the Maui wildfires stands at 114, and early cost estimates stand at $6 Billion. The fires burned 17,000 acres	> 2,000 structures
The Camp fire (California)	2018	This wildfire originated from a faulty electrical transmission line. This fire rapidly grew due to the present dry conditions and strong winds. The aftermath damage was estimated at $16.5 billion	> 18,800 structures
The Black Dragon fire (China)	1987	Drought conditions triggered this wildfire. The fire destroyed 718 million acres of forest	–
The Siberian wildfires	2019	This wildfire started in poorly accessible regions of Siberia and burned over 6 million acres	–

6.2.1.1. Direct Economic Losses

Since it characterizes the cost of the immediate devastation brought on by a wildfire, direct economic losses offer a measurable indicator that is readily apparent following a wildfire. This measure incorporates any potential profits or services that the lost structures might have produced in addition to their market value. Insurance claims, which frequently increase following a wildfire, make up a chunk of this measure. Insurance companies may be strained by such an abrupt surge in claims. Additionally, this may result in increased rates or the removal of coverage for buildings situated in high-risk zones for fires.

6.2.1.2. Indirect Economic Losses

Indirect economic losses are frequently distributed over time and space, whereas direct losses provide quantifiable indicators. Wildfires, for instance, can cause protracted economic disruptions, particularly when vital infrastructure and buildings are completely burned or seriously damaged. Business operations can be halted by power outages, interrupted supply chains, and blocked transit routes, in addition to direct damage to commercial properties. Due to their inherent susceptibility to such disruptions, small enterprises may find it difficult to restore operations. Additionally, this may lead to a decline in local economic activity and employment losses. Additionally, home prices in wildfire-prone areas may drop, particularly if insurance premiums are expensive or withheld. Federal or commercial investments may be discouraged by the perceived dangers of wildfires.
Such a move may have important societal repercussions.

6.2.1.3. Social Impact

Wildfires have other impacts other than just monetary metrics, which are social implications. An immediate consequence of wildfires is the displacement of residents using evacuation. These types of evacuations can affect thousands of people and especially families, so they can cause some logistical challenges.. The displaced locals are faced with the stressful task of rebuilding their lives, especially if their properties are destroyed. Also, families(evacuees and survivors) who undergo wildfires and the destruction of their homes, schools, or businesses. Such trauma may have a long-lasting impact on people. Furthermore, wildfire smoke and pollution can worsen respiratory disorders, endangering the health of susceptible groups.

6.2.1.4. Mitigation and Prevention Strategies

Building Codes and Strategies: Many contemporary building materials, including steel, engineered wood, FRP, and new varieties of concrete, perform worse in fire tests than conventional building materials. These types of materials can withstand high temperatures and slow down the dissemination of fire to allow first responders to respond to the fire and occupants to evacuate. Furthermore, incorporating these fire-resistant construction materials

can be a vital strategy for minimising wildfire destructive damage. Defensible spaces, which are areas where plants, debris, and other potential fire fuels are removed or minimized, can assist in increasing a structure's fire safety. For example, defensible spaces act as a buffer zone that can slow or constrain the spread of flames to construction . The National Fire Protection Association presents a systematic approach to separating such a space into zones, each one with particular purposes. Infrastructures such as transmission towers have been built without the consideration of wildfire risks, and key construction guidelines lack wildfire-specific measures. Only a few US states (California, Nevada, Pennsylvania, and Utah) have statewide codes that require wildfire-resistant structures. In addition, vegetation arrangement is inconsistent near constructions. While the outside zones have less vegetation, the areas nearest to structures are frequently cleaned.

Incorporating Structural Resilience: So, the natural response to increasing wildfire threats is to strengthen and design critical infrastructures and constructions for fire resiliency. This requirement results from the understanding that, if other fire safety precautions, including sprinklers and firefighting efforts, are ineffective, structural integrity acts as the last line of defence. Consistently, ensuring adequate fire resiliency in structural systems is an essential point to minimise injuries and fatalities among occupants and firefighters and avoid structural collapse that further minimises rehabilitation costs. Recently, building codes moderate infrastructure to shape infrastructure to withstand extreme conditions such as blasts, hurricanes, and earthquakes. However, there is an appreciable insufficiency in particular requirements or provisions for designing structures with fire resilience in mind. The lack of fire resistance regulations for bridges and tunnels, which are essential parts of transportation networks, makes this disparity especially noticeable. Deficiency of fire-resilient design criteria for these infrastructures challenges their ability to recover and withstand wildfire chaotic impacts, and leads to potential prolonged disruptions and enhanced vulnerability of communities. Wildfire resilient structures are vital for evacuation and firefighting. Structural integrity may be preserved, and fire spread may be reduced by the fire-resilient materials, improved structural detailing, and passive fire protection. Designing key infrastructures with robustness and repetition ensures functionality in extreme wildfire conditions. Structural resilience may be strengthened by incorporating such improvements and these practices into building regulations.

Urban Planning and Zoning Regulations: Further means that it has the potential to be in the service of a mitigation strategy, and is to trace conscious urban and central planning that directly integrates with fire safety conditions. This method aids in the identification of high-risk locations and vulnerable wildfire hazards, which are typically present to varying degrees. This zoning procedure depends on thorough evaluations of historically reported fire data, types of vegetation, topographical features, and climate conditions etc. Urban planners can proactively restrict or forbid construction in regions with higher wildfire hazards when these considerations are taken into account. The regions where Natural Hazard improvement

is allowed, thought-in-process shifts to implement strict rules that mandate the building of buildings with strong fire resistance.

Public Awareness and Education: There are two key components to enhancing resilience against wildfire catastrophes which are public awareness and education through promoting an effective understanding amongst people. Increasing awareness among the population through informative campaigns will reduce the casualties and property losses. Additionally, such education will prepare the public for every potential outcome. Engaging communities with such seminars and programs will foster cooperation and interaction with each other. Frequent evacuation drills (fire preparation) reduce confusion during fires and emergencies by promoting the fundamental skills needed for an effective response.

Technological Advancement: Over the centuries, firefighting technologies have evolved significantly. In early efforts, firefighting primarily relied on manual labor and basic tools, which were largely ineffective in large-scale fires. The strategic use of fire retardants and quick access to isolated locations were made possible with the advent of aircraft firefighting in the middle of the 20th century. Wildfire forecast, resource allocation, and prevention have improved in recent decades thanks to technology like Geographic Information Systems (GIS), fire modeling software, and sophisticated sensors. Firefighting has been further transformed by automation and artificial intelligence (AI), with robotics and drones allowing for accurate suppression operations and ongoing monitoring. Proactive wildfire mitigation has resulted from improved real-time data collection brought about by IoT integration. The ecological impact of battling fires is being lessened by modern technologies, such as energy-efficient equipment and environmentally friendly fire retardants. These developments enhance our capacity to anticipate, fight, and recover from wildfires.

6.2.2. Agricultural Losses

Crop & Vineyard Losses in California: Wildfires in California have significantly affected the state's agricultural and economic sectors, especially some high-value crops such as wine grapes, avocados, and citrus. Such a catastrophe is revealed in events like the 2017 and 2020 wildfires, vineyards in Napa and Sonoma ccountiesexperienced both physical destruction and smoke-contaminated fires. It renders ththerapes are unusable.

Livestock & Rangeland Damage in Texas: The Smokehouse Creek Fire occurred in 2024 and became the largest wildfire in Texas. This event highlighted the vulnerability and challenges of the livestock and ranching sector to wildfire. Additionally, small-scale and large-scale farms were affected by the fire; it killed thousands of cattle and burned plenty of grain storage facilities. The burning of almost 850,000 acres of wood and pastures severely disrupted the state's agricultural production. Texas Agriculture Commissioner Sid Miller announced that "the economic impact on ranchers is devastating," and it also has long-term effects on land repair and herd replenishment.

Nationwide Crop Losses in USA (2024): The combination of extreme heat, drought, and wildfires across the United States of America led to over 11 billion dollars in crop losses. These extreme conditions led to altered conditions in nature and resulted in widespread damage to fields, especially observed in the central regions and the eeast Most ranchers are faced with facing decreased plant capacity and income, even though federal crop insurance policies assess some financial burdens to be alleviated, and they nearly cover 53% of total losses. So, it enhanced the significance of climate-resilient farming and disaster preparedness in wildfire policy.

What are its broad economic effects? Wildfires have an impact on the entire agricultural industry in addition to the immediate harm they cause to crops and cattle. While damaged farm equipment and infrastructure might take years to repair, disrupted supply networks cause market shortages and transportation delays. Particularly at risk from lower local income and job losses are communities that mostly depend on agriculture for employment and economic stability. On a regional or even national level, extensive damage might also result in higher food costs and less product availability.

6.2.3. Tourism & Business Disruptions

Tourism disruptions and the prevalence of wildfires recently are proportionally increasing, and it is another major consequence of devastating wildfires. Wildfires result in temporary or permanent closure of natural beauties such as national parks, forests, and scenic routes, particularly in regions where ecotourism and nature-based travel are so prevalent that it leads to delays, reduced visitor numbers constantly, and decreased revenue for hotels and residents, restaurants, tour operators even local markets. Moreover, the existence of smoke (especially contamination with ground results in devastating outcomes, and air pollution discourages tourists from visiting those places even if the immediate fire danger has passed already. These disruptions have resulted in significant financial losses in places like California and the Pacific Northwest, illustrating how wildfire hazards affect not just agriculture but the entire economy.

6.2.4. Insurance Costs & Market Impacts

In addition to causing considerable disruptions in market stability, the increasing frequency and intensity of wildfires have resulted in significant rises in insurance rates. In response, insurance companies have raised prices dramatically, tightened coverage requirements, or, in some extreme situations, stopped issuing policies altogether in areas that are particularly vulnerable to wildfires, like the western United States. As a result, more and more farmers, business owners, and homeowners are left with inadequate or no insurance, making them more susceptible to financial devastation during a wildfire. Because crop insurance does not often fully cover the cumulative losses brought on by fire, drought, and smoke taint, the agriculture industry is particularly vulnerable. The enhanced challenges and risks of wildfires

promote wider insurance market instability on a macroeconomic level. Higher expectations and requirements are set by customers, leading to rising operating costs, which can deter investments and lower market confidence. Stress is also seen in reinsurance markets, where insurance companies cover themselves. Finally, it is leading to cascading effects across the financial sector. Wildfires seriously disrupt supply and commodity markets, as well as the insurance industry. Fire damage limits agricultural products like wheat, livestock, and grapes, which can raise costs and decrease supply. This impacts both export capabilities and domestic trade, especially for areas that mostly depend on crop-based revenue. In addition, the depletion of lumber and forestry resources lowers industry outputs and raises construction prices. Wildfire hazards thus produce a complex network of economic repercussions that impact local and global markets, underscoring the pressing necessity of incorporating wildfire resilience planning within economic, environmental, and regulatory frameworks.

6.3. Indirect & Long-Term Economic Effects

6.3.1. Health Costs

Wildfires are increasing in size and frequency worldwide, due in part to the hotter and drier conditions caused by global climate change. While heat from the fire can cause bodily injury, the smoke is also concerning due to the large amounts of carbon dioxide, carbon monoxide, and particulate matter released into the air as vegetation burns. Previous research and literature reviews have focused on acute health effects immediately following a wildfire, such as reduced lung function and exacerbation of chronic lung disease, as well as neurological and cardiovascular effects and increased mortality. In the U.S., the nine most devastating recession seasons have occurred since 2005, when record-keeping began. To date, the record-setting 2020 and 2021 seasons in the western U.S. have resulted in 7.7 million acres burned and poor air quality across the nation.

Table 1
Selection of wildfire events included in the scoping review. Selection includes the wildfire event, the location of the event, the acres burned (as an estimation, by the source provided), the number of reported casualties, the cost of the event in local currency, and the studies which focused on the event.

Wildfire Event	Location	Acres Burned	Reported Casualties	Estimated Cost of Wildfire Event*	Studies Which Observed This Wildfire
1997 Indonesian forest fires	Indonesia	20 million [36]	240 [37]	$5 billion USD [36]	Kim et al., 2017; Tan-Soo & Pattanayak, 2019
2009 Black Saturday bushfires	Victoria, Australia	1.1 million [38]	173 [38,39]	$4.4 billion AUD [39]	Wasiak et al., 2013
2014 Northwest Territories fires	Northwest Territories, Canada	8.4 million [40]	0 [40]	$55 million CAD	Dodd et al., 2018
2016 Fort McMurray wildfire	Fort McMurray, Alberta, Canada	1.5 million [41]	2 [41]	$3.6 billion CAD [41]	Agyapong et al., 2020; Brown et al., 2019a; Brown et al., 2019b; Moosavi et al., 2019
2018 Woolsey fire	Woolsey Canyon, California, US	97,000 [42]	3 [42]	$4.2 billion USD [43,44]	None – included as reference

To understand the future impact of these increasingly frequent natural disasters, several studies have sought to assess current and projected human exposure to wildfire smoke. A recent study predicts that the current rate of population exposure to wildfire smoke (less than 10 per 1,000 persons exposed from 1981 to 2010) will increase to between 12 and 20 per 1,000 persons across Europe in the years 2071–2100. Additionally, the health condition of firefighters should be preserved because of the health effects of occupational exposure to

wildfires in firefighters; they are a vulnerable group characterized by chronic exposure to wildfire smoke. A systematic review found that occupational exposure to smoke may increase the risk of hypertension. There is some proof that explains the long-term respiratory impacts and increased cancer risk of firefighters. Possibly due to the challenges of following firefighters from one season to the next, leading to poor follow-up. There are additional challenges to understanding the health effects of wildfires. Firstly, the combination of pollutants in smoke, such as particulate matter and HAPs, may be significantly different depending on the type of vegetation burned in a wildfire, and whether houses and other structures are also burned.

Table 2
Location, sample characteristics, and wildfire exposure assessment for each study included in the scoping review. Wildfire exposure assessment was categorized into proximity-based (residence in directly impacted or adjacent communities) or model-based (exposure derived from a statistical model).

Study	Health effect	Location	Sample	Wildfire exposure assessment	Results cited in this review
Ayapong et al., 2020	Mental health	Alberta, Canada	1,446 school staff; 725 teachers (teachers and teaching assistants) and 721 support and management staff	*Proximity-based*. Fort McMurray is the urban service area of the Regional Municipality of Wood Buffalo in Northern Alberta. The area has two school districts: the public school district and the Catholic school district. In an effort to achieve the greatest possible total sample, the online survey link was sent to the emails of all staff in the two school districts in November 2018.	Prevalence of likely MDD in school staff was 18.3% versus 9.7% for Alberta, CA and 12.6% for Canada. Prevalence of likely GAD in school staff was 15.7% versus 2.4–3% for Canada. Prevalence was higher among those who had been fearful for their life or the life of a loved one at the time of fire, or who had received limited support from their support network or from the government. Prevalence of likely PTSD in school staff was 10.2% versus 8-9% for Canada. Prevalence of self-reported PTSD diagnosis prior to the fire was 0% for respondents. Prevalence was higher among those who had been fearful for their life or the life of a loved one at the time of fire, who had watched their home burn, or who had received limited support from their support network or from the government. Female staff had almost three times the likelihood as male staff of likely PTSD. Likely MDD, GAD, and PTSD all showed significant correlation with drug abuse, but not with alcohol abuse.
Brown et al., 2019a	Mental health	Alberta, Canada	3,070 students (grades 7-12) in impacted area; 2,796 students (grades 7-12) in control area	*Proximity-based*. Data from students from Fort McMurray, Alberta, Canada (collected in 2017, 18 months after the 2016 wildfire) was compared with data from Red Deer, Alberta, Canada (collected in 2014). The same measurement scales were used for both surveys. Both of these cities have populations of approximately 100,000, and both cities are located in Alberta, Canada. For this reason, Red Deer served as a non-disaster impacted community to compare to the disaster impacted community of Fort McMurray.	Students in Fort McMurray showed a statistically significant increased prevalence of probable depression, suicidal thinking, and tobacco use than the control cohort. They had lower self-esteem and quality of life scores. Probable anxiety and alcohol or illicit substance misuse was not significantly different between the two cohorts.
Brown et al., 2019b	Mental health	Alberta, Canada	3,070 students (grades 7-12)	*Proximity-based*. Eighteen months after the wildfire, Fort McMurray public and Catholic schools surveyed 3,252 of the 4,407 students in Grades 7–12 to determine possible long-term psychological impacts. Data analysis was possible for only 3,070 students, i.e., 70% of the total student population.	Students at Fort McMurray who were not present for the fire had survey results more similar to Fort McMurray students present for the fire than to the control cohort in terms of mental health symptoms, self-esteem, quality of life, and rates of probable diagnoses for mental health conditions. Resilience scores and prevalence of suicidal thinking were higher among students impacted by the fire than those who were not. Those who personally saw the fire scored higher for all mental health components, and lower for quality-of-life scores. Those who had their homes destroyed scored higher for all mental health components, and lower for self-esteem, quality of life, and resilience.
Dodd et al., 2018	Mental health	Northwest Territories, Canada	30 participants in four communities	*Proximity-based*. This study was conducted in four Subarctic communities in the Northwest Territories that were affected by the prolonged smoke event following the 2014 wildfires: Yellowknife and N'Dilo; Detah; and Kikisa. While the communities of Yellowknife, N'Dilo, and Detah were never imminently threatened by fire during the summer, the community of Kakisa underwent a voluntary evacuation.	Common themes of interviews included feelings of fear, stress, uncertainty, and personal and community isolation.
Fann et al., 2018	Economic impacts	United States	All U.S. wildfire events from 2008-2012	*Modeling-based*. Researchers conducted an air pollution risk assessment related to daily exposure to fire-$PM_{2.5}$ during wildfire smoke events for the years 2008 to 2012 in the continental US.	A total dollar value within the U.S. for short-term premature deaths and hospital admissions was estimated to be between $11B and $20B (2010 USD); the present net value of these expenses across the 5-year time period (2008-2012) was estimated to be $63B (2010 USD). Expenses related to long-term $PM_{2.5}$-related premature deaths and hospital admissions fall between $76B and $130B per year, with a present net value of $450B for the time period of 2008-2012 (all in 2010 USD).

(*continued on next page*)

Respiratory symptoms and illnesses: In this study guide, it is discussed that long-term respiratory complications are a health effect of wildfires. Results of the Indonesian Family Life Survey (IFLS) from 1997 to 2007 revealed an average population decrease in mean lung capacity of 20.4 liters per minute, following a large wildfire in Indonesia in 1997. Mean decrease in lung capacity was more pronounced in men than in women (38.2 liters and 6.1 liters per minute, respectively). Also considered lung function for a cohort following the 1997 Indonesian fire, but found that average lung function declined in continued years.

Cardiovascular Disease: It is caused by cardiovascular disease resulting from wildfires. One projected an increased burden of acute myocardial infarction among U.S. adults aged 18–99,

from a baseline of 500 per year (averaged from 1995 to 2005) to 1,000–1,200 in 2050 and 1,500–1,800 in 2090. Health effects resulting from occupational exposure of short- and long-season firefighters (approximately 49 days per year and 98 days per year, respectively) in the U.S. were compared in another study that revealed an increased risk ratio for cardiovascular disease of 1.16–1.25 for short-season firefighters and 1.19–1.30 for long-season firefighters.

Cancer: Furthermore, the risk of cancer increases from increased exposure to compounds released during wildfires. A U.S. study found that the cancer risk due to gas-phase hazardous air pollutants (HAPs) exceeded a rate of 10 cases per million persons in parts of the western United States commonly experiencing wildfires, compared to a national average of 0.71 per million. This excess cancer risk due to wildfire smoke accounted for nearly one-third of the national average total cancer risk from HAPs. Lung cancer risks in the U.S. ranged from 1.08 to 1.26 for short-season firefighters and from 1.13 to 1.43 for long-season firefighters.

Mental Health: The effects of wildfires on mental health include increased rates of depression, suicidal thoughts, PTSD, and generalized anxiety disorder (GAD) across various populations such as students, healthcare patients, and school staff. These symptoms are often linked to factors like lack of support, fear for personal safety, direct exposure to the fire, and witnessing property loss. Common emotional responses following wildfires include fear, anxiety, uncertainty, loneliness, and a sense of isolation. In some cases, communities also experience re-traumatization during subsequent wildfire events and a rise in interpersonal violence during the recovery process. Overall, wildfires can lead to significant and lasting impacts on mental well-being.

Wildfires have been linked to a range of health outcomes beyond mental health. These include reduced overall physical health, decreased height in children exposed in utero, housing instability, and limited access to medical care. Individuals exposed to wildfire pollution have reported a higher likelihood of feeling unhealthy even years after the event. In some cases, children exposed to wildfire-related pollution before birth have shown reduced physical growth over time. Other common challenges among affected populations include unemployment, worsened pre-existing physical conditions, and barriers to receiving adequate healthcare. Burn survivors, in particular, often report a significant decline in their perceived physical health and well-being.

Economic Impact: In Canada, for the study period of 2013–2015 and 2017–2018, the yearly cost of chronic health impacts was estimated to be $ 4.3 B- $ 19 B (CDN). The estimated costs of long-term PM2.5-related premature deaths and hospital admissions ranged from $76 billion to $130 billion (in 2010 USD), with the total net cost reaching approximately $450 billion over the study period from 2008 to 2012. Another analysis projected that by the year 2090, wildfire-related PM2.5 mortality could result in annual excess economic costs of around $29 billion to $36 billion (in 2015 USD).

Other underlying health conditions, for example preexisting conditions like asthma or anxiety, and social determinants, like insurance status, housing stock, primary language and literacy, may affect the long-term health outcomes of those exposed to wildfire smoke; geographic location, socioeconomic status, culture, profession, and community-level factors (e.g., structural racism, discrimination, political will) may also affect a person's exposure to wild res and wild re smoke, and the type and amount of care they receive after exposure.

6.3.2. The Socioeconomic Impact of Wildfires

Immediate Job Loss and Business Disruption: The destruction of physical infrastructure, including farms, businesses, and public buildings, is the largest direct economic cost of a wildfire. Many businesses are forced to close temporarily or permanently due to fire damage, evacuation orders, or power outages. This causes immediate unemployment, especially in sectors that rely on local operations, such as tourism, agriculture, retail, and services.

Housing Loss and Workforce Displacement: Workers are frequently left homeless when wildfires destroy thousands of homes. People who are displaced are compelled to relocate, sometimes permanently, in pursuit of better housing and work prospects. As local labor markets contract and communities gradually lose both skilled and unskilled workers, recovery efforts are further hindered.

Indirect Effects and Long-Term Unemployment: Even after the fire is brought under control, hazardous air quality, mental health issues, and infrastructure damage can prevent a full return to work. Hospitals, schools, and transportation systems may not be able to operate for weeks or months. Even if a company makes it through, it may not be able to reach its full potential again, which can lead to job losses or reduced hours, especially for low-wage and part-time workers.

Economic Displacement and Migration: Many people are forced to relocate due to job loss or uninhabitable living conditions, resulting in economic displacement and disruption of livelihoods. In addition to reducing the population in affected areas, such displacement can increase competition for jobs and housing in recipient areas, put pressure on public services, and increase housing costs.

Table 1 Summary of notable recent wildfires

Name	Year	Summary	Structures loss
The Texas wildfires (Service 2011)	2011	A collection of severe wildfires that broke due to the 2011 Southern US drought. These fires burned about 47.3% of all burned areas in the US in that year. The resulting economic impact exceeded $3.4 billion. This wildfire resulted in 10 deaths	2,947 homes and over 2,700 other structures
The Miller's Reach Fire (Hollander 2016)	1996	The fire was triggered by drought and low humidity conditions. This wildfire burned over 37,000 acres, causing rail and road transportation between Anchorage and Fairbanks to be temporarily cut off	344 buildings
The Florida firestorm (Minshew and Towle 1999)	1998	This wildfire occurred during the drought and summer of 1998 due to lightning. The blaze crossed natural firebreaks (i.e., rivers and highways) and burned 500,000 acres	150 structures
The Hayman fire (Colorado) ("Hayman fire case study: Summary" 2003)	2002	The cause of this fire was established as arson. This fire burned over 130,000 acres and caused six deaths and the evacuation of 5,400 individuals	133 homes
The Old fire (California) (Keeley et al. 2004)	2003	This wildfire burned 91,000 acres and led to six deaths and about $1.2 billion in damages	975 buildings
The Cedar fire (California) (Brillinger et al. 2009)	2003	This wildfire burned more than 273,246 acres during October and November, costing about $1.3 billion	2,232 residential and 22 commercial buildings
The Tubbs fire (California) (Pausas and Keeley 2021)	2017	Despite not burning as large an area as other fires listed here 36,807 acres, this wildfire remains one of the most destructive in California history. The failure of a private electrical system caused this fire. The Pacific Gas and Electric Company (PG&E) filed for $13.5 billion in bankruptcy	5,643 structures
The Long Draw fire (Oregon) (Robbins 2021)	2012	Triggered by lighting and burned over 550,000 acres. This is considered one of the most significant wildfires in Oregon's history	100s of electric and utility poles

Financial Strain and Inequality: Those without access to funds, insurance, or disaster relief bear the brunt of the damage. They may fall into debt, lose access to healthcare, or become dependent on temporary assistance. As a result, wildfires exacerbate existing socioeconomic inequalities, increasing the vulnerability of low-income communities and marginalized groups to poverty and long-term instability.

Broader Economic Consequences: Wildfires can damage a region's economic reputation, deterring investment and tourism. Property values can fall, insurance premiums can increase, and municipalities can see a shrinking tax base. These outcomes create a negative feedback loop that increases reliance on external financing while slowing and crowding out recovery.

6.4. International Response & Policy Measures

6.4.1. Role of ECOFIN in Economic Recovery

Role of ECOFIN in Economic Recovery and Climate Resilience: While the Economic and Financial Affairs Council (ECOFIN) does not directly manage wildfire responses, it plays a pivotal role in enabling and coordinating the financial resources necessary for post-disaster recovery and climate resilience across the European Union. ECOFIN's financial oversight influences the allocation of EU funds that support climate adaptation, infrastructure rebuilding, and sustainable recovery. Here's how ECOFIN contributes to the broader response:

Budgetary Coordination and Approval: ECOFIN regulates the EU's Multiannual Financial Framework (MFF) and works with the European Commission to approve and distribute financial instruments. Two essential tools pertinent to wildfire and catastrophe recovery are:

- The EU Solidarity Fund (EUSF) provides emergency financial assistance to EU Member States and accession countries affected by catastrophic natural disasters, such as wildfires.
- Recovery and Resilience Facility (RRF): As part of the NextGenerationEU recovery package, this fund promotes green and digital transformations. It provides measures for developing climate-resistant infrastructure, which is critical in wildfire-prone areas.

ECOFIN also allows for budgetary flexibility in unusual circumstances, allowing countries to breach fiscal constraints in response to calamities.

Climate Mainstreaming in Economic Policy: ECOFIN promotes incorporating climate action into EU fiscal policies. It plays an important role in ensuring that national budgets align with the goals of the European Green Deal.

- Promoting climate-focused public investments.
- Endorsing carbon pricing methods like the EU Emissions Trading System (ETS).
- Supporting climate earmarking of funds under the NextGenerationEU package, which mandates that at least 37% of spending go toward climate goals.

Economic Surveillance and Country-Specific Recommendations: ECOFIN evaluates Member States' economic plans and makes Country-Specific Recommendations (CSRs) as part of the European Semester. Recommendations frequently include improving catastrophe risk management systems.

- Investing in fire prevention, early warning systems, and climate-resistant structures.
- Prioritizing eco-friendly land and forest management strategies.

This strategy guarantees that Member States recover economically from wildfires while also strengthening their resilience to future disasters.

ECOFIN and EU Civil Protection Mechanism: While ECOFIN is not directly involved in emergency coordination, its financial decisions affect the capacity and readiness of the EU Civil Protection Mechanism, which is tasked with coordinating pan-European responses to disasters like wildfires. This includes funding the rescue fleet, co-financing aerial firefighting resources, and supporting pre-positioned firefighter teams across Member States.

Thus, ECOFIN acts as a financial backbone that enables the EU to maintain and expand its capabilities in both emergency response and long-term climate adaptation.

Role of ECOFIN in Economic Recovery and Climate Resilience: The Economic and Financial Affairs Council (ECOFIN) does not directly monitor wildfire responses, however, its financial insights influence EU budget allocations that are supportive for mechanisms which address wildfires. So the EU Civil Protection Mechanism is charged to give response to wildfires and its system is mandated by the European Union.

So far in 2024, in the EU, the Copernicus European Forest Fire Information System (EFFIS) reported that the total burned area lies at about 10% above the recorded average in the years 2006–2023, while at the same time, approximately 60% more fires have been recorded.

Last year, the EU reinforced its rescue firefighting fleet (firefighting planes and helicopters) and prepositioned hundreds of firefighters for immediate support in forest fire-prone countries. The EU Civil Protection Mechanism was activated 10 times to respond to wildfires in the Mediterranean, Chile, Bolivia, and Canada. In 2024, the same level of response will be maintained.

Additionally, the importance of the EU Civil Protection Mechanism is highlighted. The fire risk is expected to further increase due to climate change. The season will be increasingly characterised by massive fires that cost lives and burn areas that take longer to fully recover.

Between 2007 and 2024, nearly 20% of all requests for assistance through the EU Civil Protection Mechanism were in response to wildfires.

Wildfires have recently become a pan-European concern. In 2022, although France, Spain, and Portugal were particularly hit, major fires also took place in the Czech Republic, Germany, Greece, and Slovenia, to name a few.

What is the point of view of EU Countries? In total, 20 EU Member States recorded more burned areas than average in 2022. The wildfire risk expanded to areas that had not previously been exposed, moving well beyond the Mediterranean region. This causes huge societal, environmental, climate, and economic losses across Europe.

In 2023, the EU's Emergency Response Coordination Centre (ERCC) channelled assistance to Albania, Bolivia, Canada, Chile, Cyprus, Greece, and Tunisia.

Furthermore, the Copernicus Emergency Management Service (EMS) regularly produces satellite maps on demand to help national authorities respond to wildfires. In the same year, Copernicus was activated 25 times for wildfires across the globe.

According to EFFIS, the number of fires larger than 30 hectares in the EU countries is 50% above average for this time of the year, while the burnt area is 8% above the average for the 2006–2023 period. The Copernicus Climate Change Service reported that August 2024 was the joint-warmest globally (together with August 2023). The average temperature for European land for August 2024 was 1.57°C above the 1991–2020 average for August, making the month the second warmest August on record for Europe after August 2022, which was 1.73°C above average.

How the EU Civil Protection Mechanism Functions: The EU Civil Protection Mechanism coordinates the pan-European assistance. It ensures that all EU Member States and participating states in the Mechanism receive timely information in times of crises and emergencies. Upon its activation by any country worldwide, the Mechanism ensures the rapid deployment of resources and personnel that are tailor-made to fit the needs of each emergency.

At the operational heart of the Mechanism lies the European Commission's Emergency Response Coordination Centre (ERCC). The Centre monitors wildfire risks and emergencies across Europe, supported by national and European monitoring services such as the European Forest Fire Information System (EFFIS).

At the onset of the wildfire season each year, the Centre engages with national authorities from EU Member States and participating states. The aim is to exchange information on the status of prevention, preparedness, and response activities and maintain close contact with national authorities throughout the wildfire season.

When an emergency hits, any country can request assistance via the EU Civil Protection Mechanism. They can ask for a coordinated, rapid, and effective international response.

When fires of such magnitude occur, Member States and participating states in the Mechanism regularly show solidarity by sending assistance in the form of firefighting planes, helicopters, firefighting equipment, and teams. Additionally, the Mechanism can co-finance the transport of assistance to the affected area as well as operational costs.

For 2024: Since 2019, the EU Civil Protection Mechanism has been reinforced with the rescUE fleet, a European reserve that includes firefighting planes and helicopters and is 100% financed by the EU. The EU also co-finances the standby availability of additional aerial firefighting capacities to address potential shortcomings in responding to fires.

Longer term, the European Commission has allocated major funds to the purchase of 12 new firefighting planes, which will be stationed in six EU member states, as well as three helicopters. These will be the "permanent rescue fleet." The first helicopters are scheduled for delivery in 2026, followed by the first planes in late 2027.

Cyprus, Czechia, Germany, Greece, Spain, France, Croatia, Italy, Portugal, and Sweden have prepared 24 firefighting planes and four helicopters for the 2024 wildfire season, which will be available to other EU Member States in the event of an emergency.

In addition, 556 firemen from 12 European countries are stationed in France, Greece, Portugal, and Spain. Cyprus, Czechia, Germany, Greece, Spain, France, Croatia, Italy, Portugal, and Sweden have prepared 24 firefighting planes and four helicopters for the 2024 wildfire season, which will be available to other EU Member States in the event of an emergency.

In addition, more than 550 firemen from 12 other European countries were stationed in France, Greece, Portugal, and Spain, assisting local fire departments when forest fires broke out. The European Civil Protection Pool also has four firefighting planes, thirteen ground firefighting teams, and one team of experts.

In addition to the response, the EU supports and complements these countries' prevention and preparedness activities by focusing on areas where a combined European strategy is more successful than individual national actions. These include conducting risk assessments to identify disaster hazards throughout the EU, stimulating research to increase disaster resilience, and strengthening early warning systems.

Prevention, readiness, and reaction work together to save lives and restrict the spread of wildfires. Having seasoned wildfire experts, well-trained firefighters, technology, and other assets close to the action makes a difference. The European Civil Protection. While these countries' national and regional governments handle wildfire prevention, readiness, and response operations, the EU can co-finance and coordinate further assistance as needed.

6.4.2. International Funding & Financial Aid Mechanism

EU Solidarity Fund (EUSF)

- **Legal Basis**

Article 175, third paragraph and Article 212(2) of the Treaty on the Functioning of the European Union (TFEU), Council Regulation (EC) No 2012/2002 establishing the European Union Solidarity Fund and Regulations (EU) No 661/2014 and (EU) 2020/461 of the European Parliament and the Council amending Council Regulation (EC) No 2012/2002.

- **Objectives**

The European Union Solidarity Fund enables the EU to provide effective support to a Member State, or to a country involved in accession negotiations, in its efforts to deal with the effects of a major natural disaster or a major public health emergency.

The Solidarity Fund is not a tool for providing rapid responses to specific emergencies or natural disasters. This is the role of the Emergency Aid Reserve.

The Solidarity Fund is the main EU instrument for supporting recovery from natural disasters and is an expression of EU solidarity. It enables the EU to provide effective support to an EU Member State (or a candidate country) to help it deal with the effects of a major natural disaster, such as a flood, forest fire, earthquake, storm, or drought. Since 2020, the Solidarity Fund has also covered major public health emergencies, such as the COVID-19 pandemic. Due to the increasing frequency and severity of extreme weather events and natural disasters linked to climate change, there is a growing recognition of the Solidarity Fund's importance.

- **Budget**

The Solidarity Fund, formed in 2002 following the Central European floods, has assisted on over 130 occasions, totaling more than EUR 8.2 billion. Since 2021, it has been amalgamated with the Emergency Aid Reserve to form the Solidarity and Emergency Aid Reserve (SEAR), with an annual budget of EUR 1.2 billion (2018 values). The EU's multiannual financial framework was updated in February 2024, with the SEAR's annual budget increased by EUR 1.5 billion to better meet growing challenges and crises.

- **Implementation**

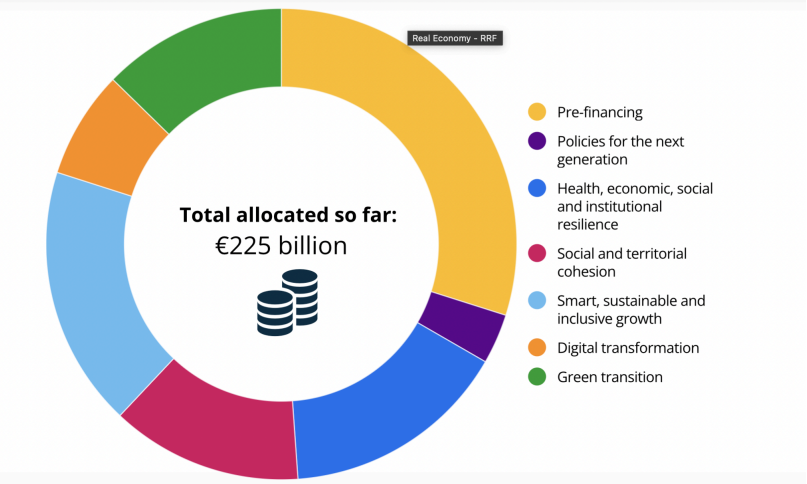
The Solidarity Fund offers grants to supplement public spending in EU Member States and candidate countries hit by catastrophic natural disasters. It addresses critical emergency and recovery measures like infrastructure restoration, temporary housing, cultural heritage preservation, and medical support. Affected countries must apply within 12 weeks of the disaster, and the Commission will review and authorize the award. Advance payments of up to 25% of the anticipated aid can be made. The money must be used within 18 months, and

the beneficiary state is responsible for ensuring correct application and auditing. A report documenting expenditures and preventive measures must be submitted six months after the deadline.

Recovery and Resilience Facilities (RRF)

What have the EU's RRF funds been used for so far? The Recovery and Resilience Facility (RRF) is a temporary measure within the framework of NextGenerationEU, aimed at strengthening the EU's resilience following the pandemic. This initiative supports various objectives, including facilitating the green and digital transition and enhancing social resilience across the EU. It also plays a critical role in implementing REPowerEU, the EU's response to energy market disruptions following Russia's full-scale invasion of Ukraine.

The RRF supports Member States through loans (€385.8 billion) and grants (€338 billion) in implementing reforms and investments that align with EU priorities and address the challenges identified in country-specific recommendations under the European Semester framework of economic and social policy coordination.



The RRF will provide around €72.2 billion for sustainable and green mobility investments (predominantly in grants), with “clean, smart, and fair urban mobility” identified as one of the flagship reform and investment components. Transport measures most eligible for RRF funding relate to transport-specific challenges such as the green transition, digital transformation, or territorial cohesion, as well as those outlined in Country-Specific Recommendations, including accelerating the use of low- and zero-emission technologies in transport.

The RRF will complement other EU funding programs, notably the European Structural and Investment Funds and InvestEU. This will contribute to leveraging the use of EU funds and avoiding duplication.

So, the European Parliament and the Council will need to approve today’s Commission proposal for EU Solidarity Fund assistance. Once the Commission’s proposal is adopted, the financial aid can be disbursed. The Commission is currently carrying out the assessment of the applications received. Once completed, it will put forward a proposal for mobilisation for the final payments.

UNDP Loss and Damage Fund for Developing: Developing countries are the most vulnerable on the list and bear a disproportionate burden in terms of experiencing the adverse impacts of climate change, including rising sea levels and extreme weather events. According to the Intergovernmental Panel on Climate Change (IPCC), developing countries have 15 times more victims of natural disasters than developed countries. Confronted with the substantial financial burdens associated with post-disaster recovery, many developing countries are seeking more support in overcoming the impacts of climate change.

At the UN Climate Change Conference 2022 (COP27) in Egypt, an agreement was reached to create a fund that will help low-income developing countries offset the damage from natural disasters caused by climate change. Named the "Loss and Damage Fund," this financial mechanism was designed to provide crucial support to vulnerable nations facing the brunt of climate-related challenges. To facilitate the implementation of the fund and related climate finance mechanisms, a transitional committee was formed, comprised of representatives from 24 nations encompassing both developed and developing countries.

The topic of climate finance for developing countries became one of the priorities on the agenda of the UN Climate Change Conference 2023 (COP28) in Dubai, UAE. During the inaugural plenary session on the conference's first day, the participants made a historic decision to create a dedicated fund aimed at addressing and compensating for the losses and damages incurred due to climate change.

"Loss and damage" refers to the wide-ranging effects of climate change, such as loss of life, property, crops, infrastructure damage, and ecological deterioration, which have both economic and non-economic implications. Financial assistance will be provided to eligible countries in the form of grants and concessional financing. The World Bank will oversee the fund, guaranteeing effective resource allocation and assisting with recovery efforts following natural disasters.

The establishment of the Fund marks the initial phase in the implementation of financial instruments aimed at addressing consequences and fostering recovery from climate-induced disasters. Discussions and negotiations are currently underway to determine the management structure of the Fund, with active involvement from United Nations Development Program (UNDP) experts.

UNDP draws on the experience and insights gained in providing the UN system’s largest portfolio of support to developing countries and communities on climate change. This includes a range of support to address loss and damage related to the impact of adverse events associated with climate change, including, for example, support on climate change adaptation, NDCs, disaster risk reduction, resilience recovery, sustainable resource management, human mobility, and human rights, among other relevant support areas.

Particular emphasis is placed on filling gaps in existing loss and damage funding systems, such as emergency humanitarian help and long-term recovery. With UNDP assistance, extensive assessments of short- and long-term requirements in disaster-affected nations have been completed.

EU Watchdogs: It is reported that only about a quarter of the €900bn of losses caused by EU natural catastrophes in the past 42 years were insured and the level of cover has been falling in recent years, the financial watchdogs said. They called for the EU to set up a new fund to cover reconstruction costs of major natural disasters, financed with contributions from the bloc's 27 member states, to bolster current resources that are "too small".

This fund would be funded by donations from all 27 Member States and would aim to supplement existing mechanisms such as the Solidarity and Emergency Aid Reserve (SEAR), which has proven insufficient in dealing with the increasing scale and frequency of climate-related disasters.

The proposed fund will strengthen the EU's ability to provide swift and comprehensive assistance to affected regions, with a focus on rebuilding vital infrastructure, restoring public services, and increasing climate resilience. It would also improve financial preparation at the EU level, lower the economic burden on individual Member States, and encourage Union solidarity in the face of rising climate concerns.

6.4.3. Investments In Disaster Risk Reduction

Investing in disaster risk reduction (DRR) is a proactive approach to reducing the effects of natural disasters and strengthening social resilience. Rather than focusing exclusively on disaster recovery, DRR prioritizes preparedness, prevention, and risk reduction. These efforts are critical for lowering the economic and human consequences of disasters, particularly wildfires.

One of the primary advantages of DRR is cost-effectiveness. The United Nations Office for Disaster Risk Mitigation (UNDRR) has found that every dollar spent on risk mitigation can save up to $15 in future damages. This makes disaster risk reduction not only a humanitarian obligation but also an effective economic approach.

Key areas of DRR investment include:

- Early Warning Systems: Developing technologies that provide timely alerts to populations at risk.
- Resilient Infrastructure: Strengthening buildings, transport, water, and energy systems to withstand natural hazards.
- Community Preparedness: Educating and equipping local communities to respond

effectively to emergencies.

- Sustainable Land Use: Promoting forest management, reforestation, and controlled land development to reduce wildfire risks.
- Insurance and Risk Transfer Mechanisms: Expanding financial tools to share and absorb the economic shocks from disasters.

The EU and international actors, including the UNDRR and the World Bank, promote integrating disaster risk reduction (DRR) into national development plans. The EU supports DRR-focused projects that improve climate resilience and long-term sustainability through instruments such as the European Structural and Investment Funds (ESIF), Horizon Europe, and the Recovery and Resilience Facility (RRF).

6.4.4. Carbon Markets & Sustainable Land Management Policies

As wildfires become more frequent and intense as a result of climate change, incorporating environmental policy instruments like carbon markets and sustainable land management is becoming increasingly important in dealing with both economic and ecological effects.

Carbon markets are financial systems that place a monetary value on carbon emissions, allowing countries, businesses, and organizations to exchange emission allowances or credits. These markets incentivize emission reductions while also rewarding carbon sequestration measures like reforestation, enhanced soil management, and forest ecosystem preservation. Forests operate as large carbon sinks, so their conservation directly contributes to lessening the likelihood and severity of wildfire. Carbon markets contribute to wildfire prevention and recovery efforts by valuing the carbon stored in healthy ecosystems.

Meanwhile, sustainable land management (SLM) refers to strategies that use land resources, soils, water, animals, and plants in such a way that they remain productive and healthy over time. SLM in fire-prone areas consists of controlled burns, vegetation management, replanting, and soil conservation strategies. These approaches help to minimize fuel loads, improve biodiversity, and increase wildfire resilience. Furthermore, they help rural economies by encouraging sustainable agriculture and forestry.

Together, these two approaches form a powerful synergy: carbon markets give financial incentives, while sustainable land management provides on-the-ground action. Policymakers around the world, including the European Union, have acknowledged the value of these instruments in climate adaptation and disaster risk reduction efforts. The EU Emissions Trading System (ETS) and global programs such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation) are prime examples of how carbon markets may promote sustainable land management.

Finally, developing carbon market frameworks and investing in sustainable land policy not only helps to mitigate climate change, but also builds economic and ecological resilience in the face of worsening wildfires.

7. Challenges and Failed Solution Attempts

Inadequate Funding and Investment: A major barrier to effective wildfire management is the lack of sustained financial support. Short-term funding often prioritizes emergency response over long-term prevention. Many countries struggle to allocate sufficient budgets for forest maintenance, community preparedness, and infrastructure upgrades. Even existing funds, such as the EU Solidarity Fund or RRF, may be too small, delayed, or difficult to access in time to be fully effective.

Poor Land-Use Planning and Enforcement: Urban expansion into fire-prone areas without proper zoning regulations has significantly increased the risk of fire damage. Sustainable land management policies are often either underdeveloped or not enforced due to weak governance or conflicting economic interests, such as agriculture, tourism, or mining.

Coordination Gaps Among Agencies: Wildfire response requires many levels of government, environmental agencies, and local governments. Many previous attempts failed because of ineffective coordination, unclear duties, or a lack of communication across sectors and countries. This has resulted in delayed evacuations, inefficient use of firefighting resources, and multiple mishaps.

Over-reliance on Suppression Over Prevention: A major flaw in wildfire strategy is prioritizing firefighting above risk reduction. Fire suppression without concurrent investment in fuel management (e.g., prescribed burning, dead vegetation removal) has, in certain situations, exacerbated the situation by allowing flammable materials to collect over time.

Underestimation of Climate Change: Some strategies have misjudged the rising effects of climate change on wildfire trends. Previous preventative models based on historical data are no longer effective in anticipating fire behavior in today's rapidly warming climate. This mismatch has resulted in obsolete strategies and insufficient readiness.

Insurance and Recovery Gaps: Only a small percentage of economic damages from wildfires are insured, particularly in rural or low-income communities. Recovery methods are frequently delayed and bureaucratic, leaving impacted communities vulnerable and unmotivated to rebuild resiliently.

8. Possible Solutions

Strengthening Early Warning Systems: Investing in modern technology like satellite surveillance, AI-powered forecasting, and integrated fire alert platforms can assist in detecting and predicting fire breakouts. Timely warnings allow for quicker actions, saving lives, property, and ecosystems.

Sustainable Land Management: Promoting appropriate land use through reforestation, afforestation, and controlled burns reduces fuel loads while restoring natural fire resistance. Integrating Indigenous knowledge with nature-based solutions improves the effectiveness of land stewardship.

Increased Investments in Prevention and Resilience: Public and corporate expenditures should prioritize fire-resistant infrastructure, ecological restoration, and community preparedness. Long-term projects should benefit from broader and more accessible funding sources such as the EU's Recovery and Resilience Facility (RRF) and the Solidarity Fund.

Insurance Reform and Risk Sharing: Developing inexpensive, comprehensive insurance plans for wildfire-prone communities can help to mitigate economic disruptions. Risk-sharing measures, such as EU-wide or regional recovery funds, can help to disperse financial costs more evenly.

Cross-border and Interagency Cooperation: Wildfires frequently cross national borders. Improved collaboration between countries, particularly in regions such as the Mediterranean and North America, can lead to more resource sharing, joint training, and mutual aid agreements. Strengthening structures such as the EU Civil Protection Mechanism is essential.

Community-Based Adaptation and Education: Providing education, volunteer fire brigades, and disaster drills empowers local communities and raises awareness. Communities that understand risk are more likely to implement safe practices and support long-term policy.

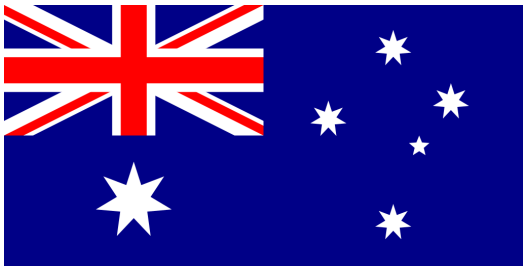
Integration of Climate Change Mitigation Policies: Addressing core causes through climate action, such as decarbonization, carbon pricing, and investment in green infrastructure, helps to alleviate the conditions that exacerbate wildfires. Aligning wildfire policies with the European Green Deal and the United Nations' Sustainable Development Goals ensures long-term coherence.

Improved Data Collection and Policy Evaluation: Collecting disaggregated data on fire frequency, economic losses, and recovery effectiveness enables evidence-based policymaking. Regular evaluation of existing programs can help adapt and improve over time.

9. Major Parties Involved

United States of America The United States is seeing periodic catastrophic wildfires, particularly in California and the western states, resulting in significant economic and infrastructure losses. It promotes stronger public-private insurance arrangements, more investment in forest management, and carbon market integration. The United States is skeptical of mandatory international finance obligations, but it supports voluntary aid and climate resilience initiatives.

Brazil: Brazil, home to the Amazon rainforest, is severely impacted by both natural and human-caused wildfires. It emphasizes national sovereignty over forest management and opposes external coercion, notably on deforestation policy. However, it supports international financial channels for reforestation, fire control, and sustainable agriculture, as long as they are linked to national development goals.

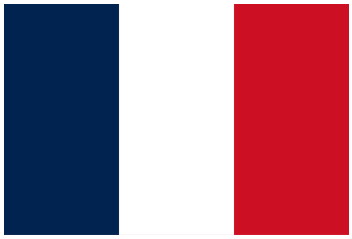


Australia: Australia's arid environment causes strong wildfire seasons. It promotes investment in early warning systems, climate adaptation, and robust infrastructure. While it promotes international cooperation, it insists on national authority over money allocation. Australia also advocates for insurance market reforms and greater emissions trading regimes.

Canada: Canada, which is experiencing growing wildfire hazards as a result of climate change, supports stronger international financing for risk mitigation and recovery. It promotes carbon price schemes and prioritizes indigenous land stewardship. Canada encourages data exchange, cross-border firefighting collaboration, and resilient infrastructure construction.

Germany: Germany leads the EU in climate resilience and sustainability. It encourages strong ECOFIN involvement in incorporating wildfire recovery into EU economic strategies and boosting the Solidarity and Emergency Aid Reserve (SEAR).

Germany promotes climate mainstreaming in fiscal policy and prioritizes green recovery investments.



France: France advocates for increased EU coordination in wildfire response and a dedicated EU catastrophe recovery budget. It advocates for sustainable land management, carbon credit trading, and tougher environmental legislation. France also wants to see more accurate insurance structures for climate threats.

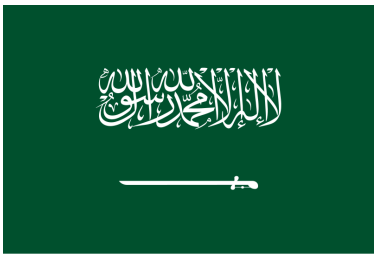
China: China sees wildfires primarily as a development concern. It promotes capacity building and disaster risk reduction via infrastructure development and technology transfer. It is wary of international monitoring and conditional aid, but prefers South-South collaboration and knowledge-sharing platforms.

India: India approaches wildfires from the perspectives of rural development, poverty reduction, and environmental protection. It calls for foreign aid to help communities avert fires and create capability. India highlights the importance of technological availability and sustainable forestry, but it opposes strict climate-related financial restrictions.

Russia: Russia is seeing major wildfire activity in Siberia and the Far East. It emphasises sovereign responsibility and is suspicious of international oversight. Russia supports forest management improvements and satellite monitoring, but it opposes foreign meddling or environmental sanctions.

Indonesia: Indonesia has frequent wildfires caused by palm oil growth and land removal. It promotes international funding for reforestation, peatland restoration, and sustainable land use. However, it is concerned about global climate systems that may limit national development ambitions.

South Africa: South Africa favors better global catastrophe financing structures and regional cooperation, particularly within Africa. It emphasizes the vulnerability of developing economies and advocates for equitable access to technology and money for fire protection, particularly in rural communities.



Saudi Arabia: Although not prone to wildfires, Saudi Arabia is interested in risk financing and insurance mechanisms. It supports leveraging sovereign wealth to build climate resilience and is becoming increasingly involved in global climate finance discussions. It encourages innovation in carbon markets while emphasizing national autonomy.

Türkiye: Turkey, which is increasingly impacted by Mediterranean wildfires, has called for flexible EU support and emphasized the need for tourism recovery. It encourages investments in fire-resistant infrastructure and regional cooperation. Turkey requests technical and financial assistance from ECOFIN while remaining consistent with larger green transformation aims.

10. Timeline - Key Events

1988 - The Intergovernmental Panel on Climate Change (IPCC): The IPCC was established to study climate change science in 1988, and it aimed to give leaders regular information on how climate change and global warming may change wildfires. With these rising global temperatures, global warming can dry out forests and create more fuel for fires. Warmer weather also extends fire seasons, consequently, fires can start earlier and last longer. The IPCC studies whether global warming makes big wildfires more common, and they examine whether warming makes these fires more intense. Their reports help show the link between climate change and fire risk. Finally, these findings help leaders make plans to reduce fire dangers in the region.

1992 - United Nations Framework Convention on Climate Change (UNFCCC): The 1992 UNFCCC was an essential agreement signed during the Earth Summit in Rio de Janeiro. This treaty made an important step for global cooperation on climate issues. It was created to bring countries together to find ways to reduce greenhouse gas emissions and limit the impact of climate change. Since then, global climate initiatives have been important in shaping how countries address the increasing threats of wildfires and other climate disasters.

2003 - European Heatwave and Wildfires: Unusual heat led to significant wildfires across Portugal, France and Italy. Estimated economic losses reached €1 billion, leading the EU to develop early warning and fire prevention systems. This record high temperatures across Europe resulted in at least 30,000 deaths (more than 14,000 in France alone). The heat wave raised concerns over global warming and Europe's readiness for climate change.

2009 - Australia faced the Black Saturday Fires: Australia experienced one of its deadliest wildfires, causing economic damages of AU$ 4.4 billion. These bushfires killed 173 people, and another 414 people were injured. More than 450,000 hectares had burned, and 3,500 buildings, including more than 2,000 houses, were destroyed. These fires led Australia to examine its approach to wildfire management. National authorities looked closely for fire preparedness, emergency response, and recovery plans. They recognized the need for better early warning systems and improved firefighting techniques. Insurance companies also reviewed their policies to cover the rising risks of huge fires, and governments increased funding for wildfire prevention programs.

2010 - Russian Wildfires and Heatwave have burned across the country: Russia experienced one of its worst wildfire seasons. Fires destroyed millions of hectares of forest, causing air pollution in Moscow, and it led to significant economic losses in agriculture and business. Over 50,000 fires burned across Russia and the economic impact was estimated at $15 billion.

2016 - Fort McMurray Fires, Canada: Over 88,000 residents were evacuated, and damage was valued at nearly $9 billion, making it the costliest natural disaster in Canadian history. Recovery efforts highlighted the role of insurance and government assistance in past wildfire economic recovery. The damage affected thousands of homes, businesses, schools, roads, and utilities.

2019 - Amazon Rainforest Fires, Brazil: In 2019, the Amazon Rainforest faced a global increase as Brazil reported over 80,000 wildfires. These fires caused serious environmental and economic risks and impacted Brazil's economy and local communities. These impacts were significant. The Amazon rainforest gives local communities resources such as plant medicines, fruits, and nuts. It also supports the agriculture and forestry industries. When the fires destroyed parts of the rainforest, local farmers and groups lost income and struggled to support their families. Also, tourism, which contributes to the economy with the beauty of rainforests, dropped because visitors avoided areas affected by smog and burned landscapes. The cost to put out these fires was too high, and it was putting a strain on government resources and emergency services.

2020 - California Wildfire Season, USA: Almost 4 million acres burned during the worst fire season in California, causing over $12 billion in property damage. Many homes, businesses, and natural habitats were destroyed, ruining the local communities and emergency services. This situation highlighted the urgent need to address climate change to prevent future disasters. As a response to the severity of the fires, California’s government took action to address the damage from the fires. They made reforms to improve their carbon market. These reforms aimed to reduce greenhouse gas emissions and slow climate change to prevent wildfires from getting worse. The state also made adjustments to wildfire insurance policies. These changes help landowners and homeowners manage wildfire risks and recover

from the damage better.

2021 - Türkiye Wildfires: In the summer of 2021, Turkey faced a devastating series of wildfires in its fire history. More than 200 fires broke out in 53 provinces, especially affecting the areas of the Aegean and Mediterranean coasts. The areas that were most damaged by the fires were the popular tourist destinations such as Antalya, Muğla, Adana, and Mersin. Emergency teams worked hard to contain the flames, but some people lost their lives, and many were injured. The local tourism industry suffered when hotels and businesses had to shut down, leaving many workers unemployed just before the summer season.
Economically, the cost of the wildfires exceeded millions of dollars. Property damage, lost crops, and damage to tourism infrastructure created a heavy financial burden for local communities and the government. Emergency funds were used to support firefighting efforts and aid recovery but Turkey's efforts against disaster were not enough and the government couldn't handle the crisis. Their efforts were insufficient and it was too hard to control the fires quickly with the limited access to firefighting aircraft and weak coordination.

2024 - UN and World Bank promote funding for Wildfire Recovery: In 2024, the United Nations and the World Bank started to increase their funding for wildfire recovery efforts around the world. Their move aims to combat the damage caused by wildfires since they have become more frequent and extreme due to climate change. These international organizations recognize that wildfires keep destroying land and property and also threaten livelihoods and local economies for years. With this financial support, they aim to help affected communities rebuild faster and be prepared enough for the upcoming fire seasons. The goal of the UN and the World Bank is to reduce the financial impact of wildfires and help the communities to make them recover and become more prepared and strong for future dangers.

11. Questions to be Answered

- What are the primary economic consequences of wildfires at the national and global levels, and how can ECOFIN address them?
- How can the EU and international financial bodies strengthen funding mechanisms for wildfire prevention, response, and recovery?
- To what extent should international funding (e.g., through SEAR, the Solidarity Fund, or the Loss and Damage Fund) be scaled up or restructured?
- How can carbon markets and sustainable land management policies be better integrated into wildfire risk reduction strategies?
- What role should public-private partnerships and insurance mechanisms play in wildfire resilience and reconstruction efforts?
- How can Member States and the international community ensure fair and efficient distribution of financial aid, especially to developing or wildfire-prone countries?

- How should ECOFIN prioritize climate-related disaster funding within the EU's long-term economic planning and budgetary frameworks?
- What lessons can be drawn from failed or insufficient wildfire policies, and how can these inform future economic strategies?
- How can economic policies support vulnerable sectors like agriculture, tourism, and infrastructure in recovering from wildfire-related losses?
- What mechanisms can ensure accountability, transparency, and proper implementation of financial support in wildfire-affected regions?

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13. Further Reading

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