



# Turkey 2021 Forest Fires:

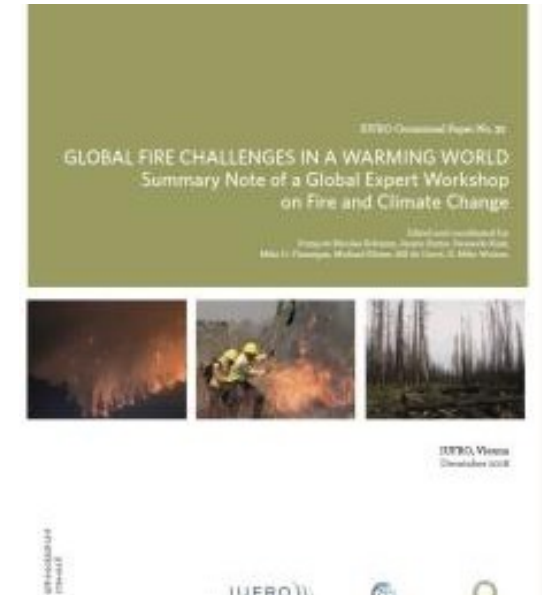
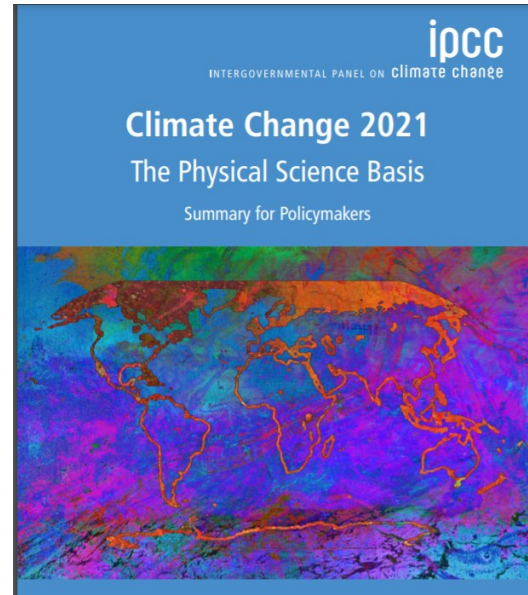
## Preparing for future climate extremes

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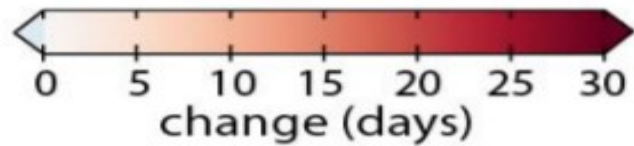
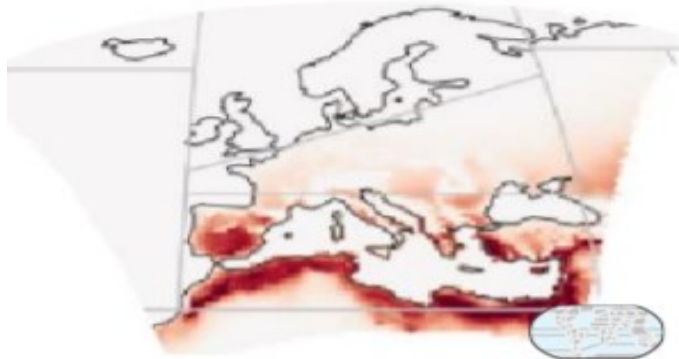




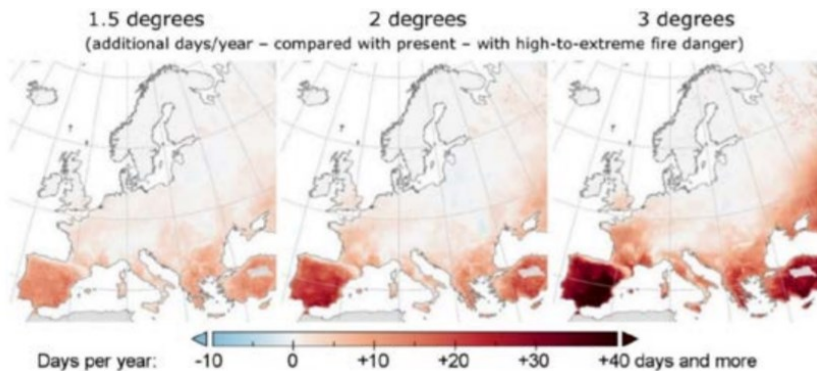
# Forest Fires in a Changing Climate

- Global surface temperature during 2001-2020 was 0.99 °C higher than 1850-1900 levels. Due to climate change, the area with high probability of wildfires could increase by up to 110%.
- Wildfire seasons have already become longer and harsher around the world. In 2019 and 2020, extreme wildfires burned in the Amazon, Alaska, Australia, California, Europe, Indonesia and Russia.
- Wildfires cause significant ecological, economic and social damages. They are responsible for 5–8% of the 3.3 million annual premature deaths due to poor air quality are a major source of GHG emissions and forest destruction, and increase the impacts of post-fire floods.
- Extreme wildfires are a result of adverse weather conditions (aggravated by climate change), and poor planning and preparedness. It is widely understood that about less than 10% of wildfires result in more than 90% of the total area burned annually.
- The impacts of extreme wildfires can be prevented and/or significantly reduced with the right fire-smart approaches.

## JJA Days with Daily Maximum Temperature above 35°C



Projected temperature changes for 2041–2060 relative to 1995–2014  
(Source: IPCC AR6 WG1, 2021)



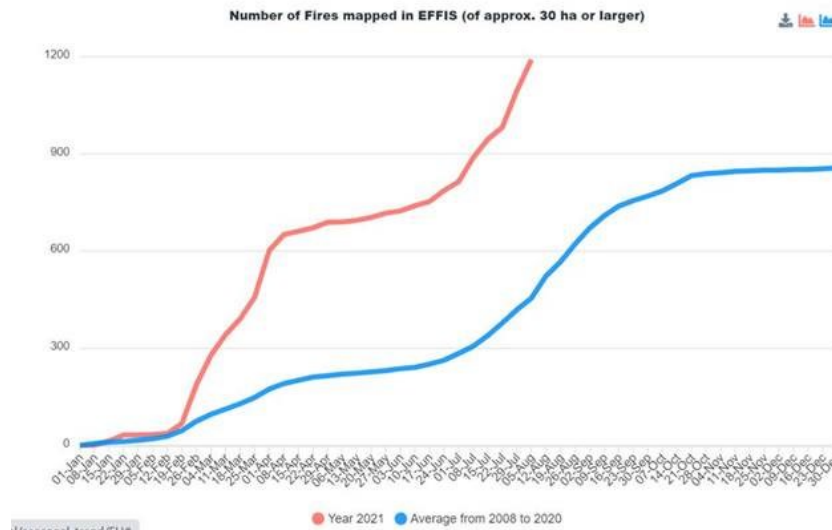
Forest fire danger under different climate change scenarios (1.5°C, 2 °C, and 3°C)

(Source: Costa, et al., 2020)

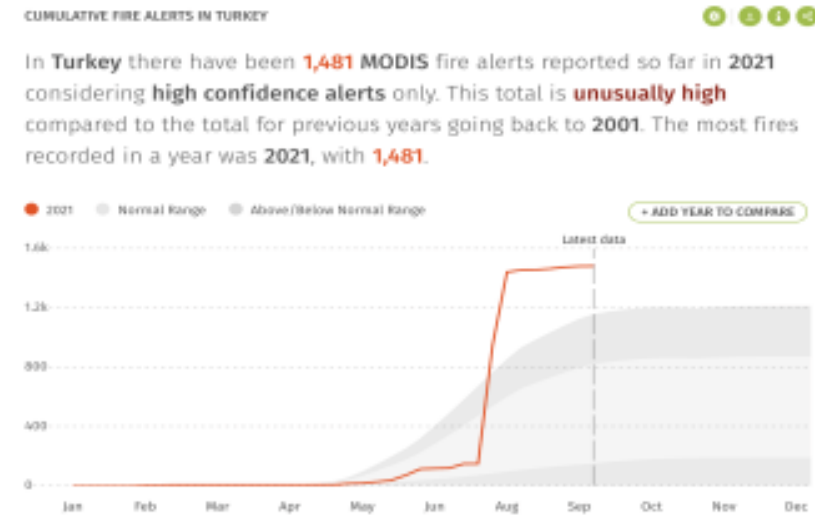
## Projected fire weather changes in Europe

- According to the latest IPCC report, temperatures will rise in all European areas at a rate exceeding global mean temperature changes, regardless of future global warming.
- For the Mediterranean, IPCC projects a combination of warming, temperature extremes, increase in droughts and aridity, precipitation decrease, **increase in fire weather**, mean and extreme sea levels, snow cover decrease, and wind speed decrease by mid-century and at global warming of at least 2°C and above.
- Under a 3°C warming scenario, it is estimated that the number of people exposed to high-to-extreme fire danger levels for at least 10 days annually would increase by 24%. Southern European countries would experience the most fire risks as those countries have already experienced severe and frequent wildfires.

# Turkey Forest Fires: An Overview of the Crisis



Number of fires in EU Countries in 2021 (trending above average)  
(Source: European Forest Fire Information System)



Fire Alerts in 2021 were unusually high in Turkey  
(Source: Global Forest Watch)

- Worst-ever wildfire season in the country's history
- Starting on July 28, 2021, severe forest fires broke out in the Yeniköy area of Manavgat district of Antalya province in Southern Turkey
- 300 fires burnt across a two-week period in multiple fronts
- The burnt area was the largest ever recorded in Turkey in a single fire season (estimated 170,000 hectares), and 25-30 times the average between 2008 and 2020 (~7,000 ha)
- Forecasts predict that the wildfire and heat risks will likely persist at extreme levels.



# The Causes of Forest Fires: Weather and Preparedness

- Pre-existing extreme fire risk due to extreme heat and dry weather and high winds.
- Record temperatures and a severe drought with average temperature 3-6 degrees Celsius above normal - many areas sustained temperatures above 40 degrees Celsius for days.
- Multiple fronts at the same time surpassed firefighting capacity.
- In temperate regions causes are often related to land and fuel load mismanagement, human error, accidents, land abandonment, lack of community cooperation, and natural phenomena.
- In Turkey overall fire causes are 90% anthropogenic / 10% natural (lightning)
- On average, the cause of 60% of all anthropogenic fires is classified as of “unknown” origin
- Management causes are under investigation by government authorities



*GEFF fire danger forecasts initialized on 31 July 2021, showing 'very extreme' (purple shading) around the Mediterranean  
(Source: European Forest Fire Information System)*

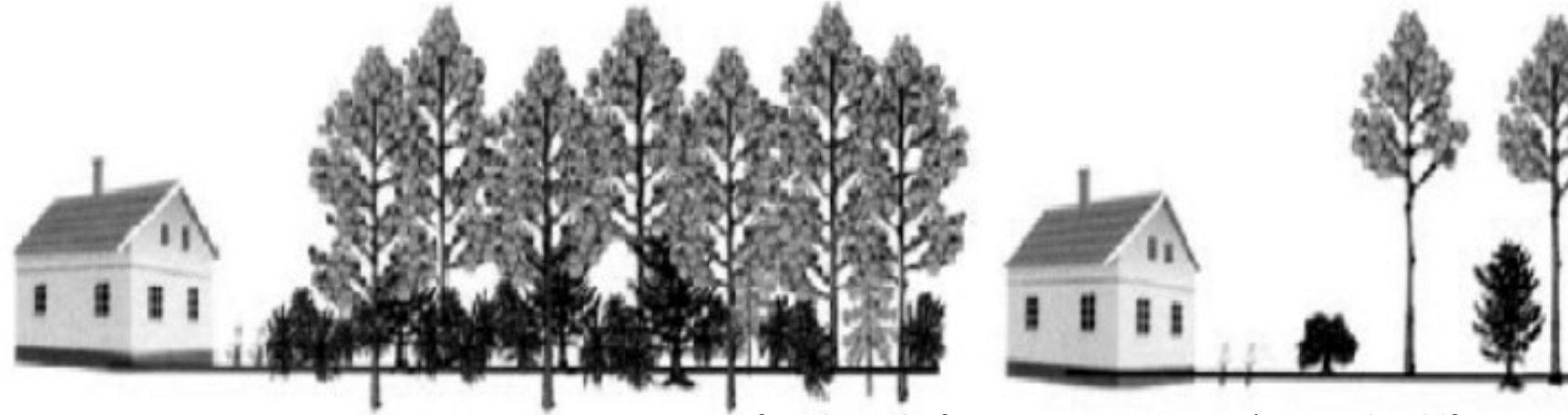


Image of Fuel Breaks for WUI zones Source: (Portugal Wildfire, 2018)

## Wildland-Urban Interface (WUI)

- The WUI is a transition zone where wildlands interact with humans and their activities, also known as rural-urban interface
- WUI fires are prevalent in Northern and Southern Europe and USA, generating great social and economic losses
- Due to housing demands more development is occurring in the WUI and those homes and industries near the wildland are increasingly susceptible to fire when interventions to reduce fuel in surrounding areas is not undertaken (see figure)
- Essential to establish housing and urban planning standards and regulations (standardized building codes) and interventions regarding the houses and buildings in WUI areas in coordination with multiple agencies

# Fire's Catastrophic Impacts

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- The level of damage is considered unprecedented
- 17 casualties including firefighters, many people hospitalized
- 4,000 tourists were evacuated by boat from the resort community of Bodrum
- Multiple forest villages and towns in Milas, Bodrum and Antalya evacuated
- Farms, livestock, forests and homes have been destroyed
- A power plant in Mugla was deactivated and evacuated
- Historical areas and unique flora and fauna affected





# Government of Turkey Response

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- Immediately declared disaster affected areas
- 5,200 staff, 1,000 vehicles, 660 bulldozers, 51 helicopters, 16 aircrafts and 9 UAVs were used
- Accepted help from Russia, Azerbaijan and the EU to manage the fires
- Pledged to rebuild destroyed property and cover the rents of those left homeless within a month
- Fires were put under control by 12 August, 2021
- Faced media criticism and public reaction





# Current Turkish Forest Fire Management



## Strengths

- State control of fire and land managed by the Turkish General Directorate of Forestry (OGM)
- Penalties for starting forest fires
- Early Warning and Management System
- Extensive road networks, use of fuelbreaks, water impoundments and silvicultural practices

## Weaknesses

- Lack of definition of forest fires in laws and regulations
- The granting of licenses (tourism, mining etc.) on forest land
- Lack of preventive provisions
- Lack of legislation on training and awareness
- Lack of community participation
- Investigative capacity

*Source: Elvan et al. 2021. Forest fire and law: an analysis of Turkish forest fire legislation based on Food and Agriculture Organization criteria*

# International Best Practices: Prevention, Preparedness, Response, Recovery (PPRR)

Action towards increasing resilience to extreme wildfires requires a multi-sectoral effort at the global, national, and local levels. **The World Bank has developed recommendations for wildfire management under climate change:**



## 1. Policies and incentives to promote fire-smart landscape approaches:

*clear legal settings and incentives that remove distortions and encourage appropriate land management and fire use*

## 2. Investment in both fire prevention and suppression:

*can result in significant cost-savings and avoidance of loss and damage*

## 3. Implementation of existing fire management good practices:

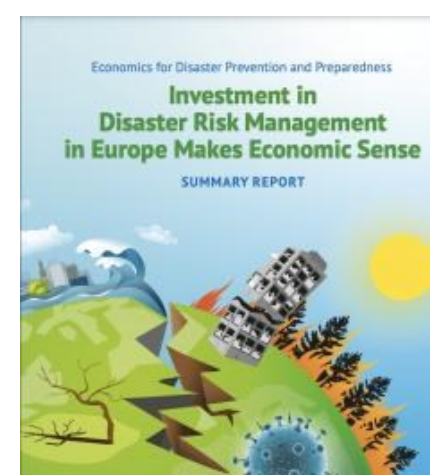
*strengthening detection and fire danger systems, fuel load management, and working with communities on restoration*

## 4. Wildfire data collection, analysis, and review:

*to support information collection and analysis to improve the understanding of fire causes*

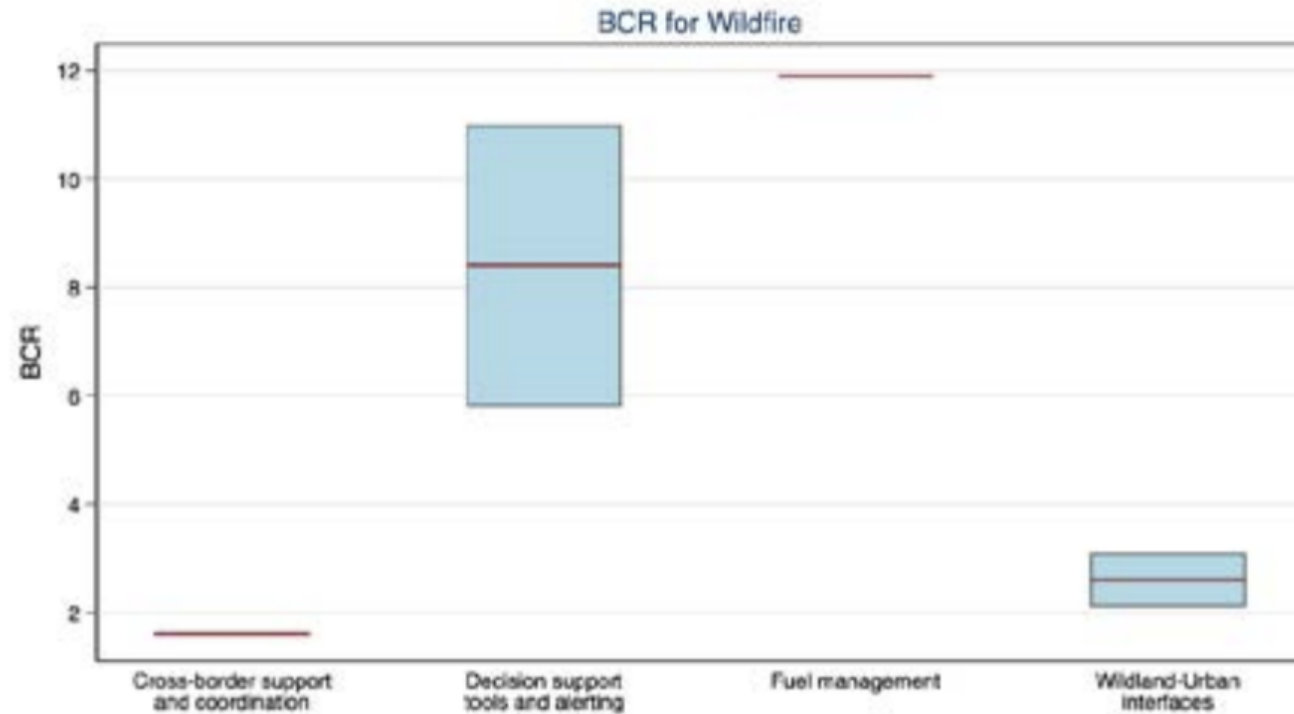
## 5. Stakeholder coordination and preparedness:

*defining the functions, tasks, and responsibilities of all institutions involved in fire management to enable effective coordination*



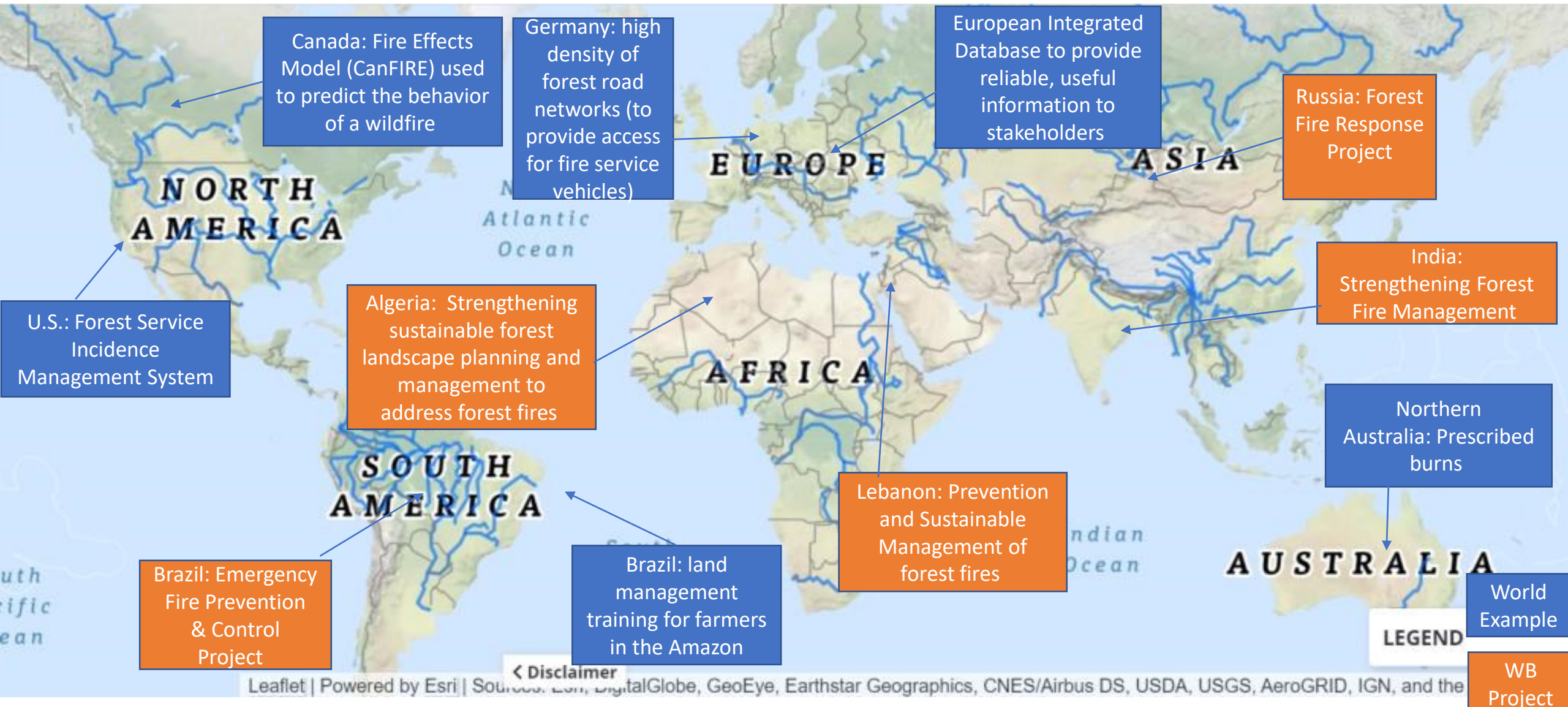
# Investing in fire management and prevention makes economic sense

- Investments in wildfire risk reduction yield net benefits.
- Median BCRs exceeding 10 are found for decision support tools, alert systems, and fuel management.
- Crossborder collaboration tools and management of the wildland-urban interface also yield positive benefits
- A forest decision support system for small forest owners in Austria was assessed with a BCR of 5.8.



**Distribution of benefit-cost ratios (BCRs) for wildfire investments.**  
(Source: World Bank 2021. *Investment in Disaster Risk Management in Europe Makes Economic Sense*)

# Best practices across the world and WB projects



# Examples of Best Practices around the world

## Prevention:

- Portuguese pilot program to enlist shepherds in fire-prone areas and use goats to clear low-lying fuel
- Croatian video surveillance for monitoring and preventing forest fires

## Detection:

- USA National Fire Incident Reporting System: inter-agency coordination and world's largest national database of fire incident information
- Canadian Meteorological Fire Hazard Indicator System

## Suppression:

- Australian bush fire suppression: use of tracked machines to build fire breaks, water bombers, and fire itself
- Slovenia automated daily forest fire-risk forecast system to develop fire-fighting exercises

## Restoration:

- USA Burned Area Emergency Response (BAER): long-term rehabilitation through planting trees, reestablishing native species, repairing damage to facilities, and restoring habitats





## World Bank Project: Russia Forest Fire Response Project



### Interventions (US\$121.3m):

- Inter-regional forest fire centers
- Public awareness and education campaigns
- Local state forest enterprises and Protected Areas
- Model forest management, PA fire management
- Improving inter-agency coordination
- Forest pathology, pests and diseases
- Best practices for suppression: thinning of forests and undergrowth, creating fire breaks, and ensuring diversified vegetation and forests.



## World Bank Project: Brazil Emergency Fire Prevention & Control Project

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### Interventions (US\$27m):

- Aimed to prevent and control large-scale wildfires in the southern part of the Brazilian Amazon during the dry season of 1998
- Assessment and fire monitoring, which uses appropriate technology
- Integrating soil moisture maps, forest type maps, human activity maps
- Studies and long-range planning
- Forest fire prevention technical assistance and educational campaigns for local communities and different stakeholders
- Intensive enforcement operations and compliance to regulations to prevent and regulate illegal burning activities
- Contingency plans to combat forest fires and refers control of major fires to a federal task force.



# World Bank Project: Kazakhstan Forest Protection Project



## Interventions:

- Pilot area of 650,000 ha
- ~ 60% fires caused by humans at beginning of project
- Changed use to protected area
- Introduced Forest Fire Control Information System
- Invested in prevention activities
- Improved Detection
- Improved Access to reduce response times
- Improved fire fighting capacity
- Worked with communities

## Results:

- Optical sensors see further – detect fires ~ 15 mins sooner than human operators
- 20% less fires over all
- Fires caused by humans dropped from 60 to 35%
- Average fire size dropped from 23.7 ha before installation to 1.7 ha





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## Romania: Increasing the capacity of fire response services - municipal and forest agencies



- Romania has invested in equipment, training and number of fire fighters in the last 5 years and has made a noticeable difference in their ability to suppress forest fires
- Provided assistance to Greece during August 2021 forest fires:
  - 112 rescue firefighters from Romania (6 fire trucks, 2 tanks, 1 command center, 4 Multi-risk containers, 1 generator, 2 mobile camps, 1 intervention bus, 2 minibuses, 4 first aid and command trucks )
  - Set up an independent center overnight with logistics services
  - Mapped forest roads with drones, calculated the wind direction
  - Took advantage of the dozens of streams
  - Used secondary roads not to impede traffic





## Priority Areas:

Forest Fire  
Management is  
Disaster Risk  
Management



### Prevention:

The suite of activities that can reduce the incidence and/or severity of fire. If ignitions can be prevented from happening, fires will not occur to the same extent and severity



### Preparedness:

Effectively ensuring that all processes required for effective management are operational or able to be operationalized with minimal notice



### Response:

Reaction to weather forecast/s or onset of adverse weather, provisions for public announcements about fire potential and for ongoing fires



### Recovery:

Post fire restoration of burnt areas including forest regeneration, repair of damaged facilities, equipment replacement

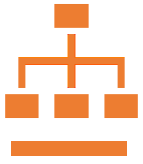


## Prevention

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- **Fuel load management:** this can occur under forest canopy or on 'protection zones' to create a fuel free fire break, through silvicultural treatments, animal grazing, or prescribed burning.
- **Training and education programs for communities:** to support communities in the affected areas assess their current understanding of wildfire, determine knowledge gaps, and identify areas in need of guidance





# Preparedness

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- **Identification of Incident Management structures:** to strengthen coordination between agencies and vertical levels of government (State-Province- Municipal/ Local) and non-government agencies before, during and after major disaster events
- **Fire Danger Rating System and Early Warning System:** OGM has indicated its intent to progress with development of a Turkey specific fire danger rating system
- **Legislation:** a review and consolidation of fire legislation to specify how to assist with fire management activities and identify responsibility for supplying areas with appropriate equipment
- **Road and Trail Maintenance and Construction:** ensure forest roads and fire trails are free of shrub and tree vegetation to provide a more robust fire break and enable access for all forestry operations including fire management
- **Assess water supplies:** in elevated and dissected terrain and construct static water supplies (dams, ponds, pools) for fire vehicles to avoid traveling far distances to the water supply
- **Community Fire Strips :** establishment and maintenance of protection strips or between forest lands and community lands





## Response

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**Provision of plant and equipment:** assessment of appropriate firefighting equipment that enables government agencies, communities, and civil society organizations to have an effective response to unwanted fires including:

- fire rakes
- personal protective equipment
- knapsack spray
- communication facilities
- personal protective equipment for “community based” firefighters, a supply of firefighting hand tools
- first aid supplies
- suitable response vehicles

**Community and Municipal Forest Fire Response Plans**





## Recovery

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- **Re-establishment of burnt forest:** monitor development of forest regeneration to ensure native plants/animals recover and unwanted species do not dominate, promote species change, watershed management
- **Forest Fire Investigation:** debriefing following fires to identify any shortfalls in operating procedures
- **Post-fire reviews:** to identify what worked and what didn't



One month after the forest fires in Antalya province, wild horses who fled their habitat are back in the Eynif Plain  
Source: *Daily Sabah*

## Summary



Forest Fire Partnerships:  
Getting everyone ready for the next fire!

PREVENTION	PREPAREDNESS	RESPONSE	RECOVERY
Fuel load management <ul style="list-style-type: none"> <li>○ Prescribed fire</li> <li>○ Grazing</li> <li>○ Removal of fuel</li> </ul>	Incident Management Structure - Cross agency, government, and stakeholders	Provision of training, plant and equipment to <ul style="list-style-type: none"> <li>○ OGM</li> <li>○ Other agencies</li> <li>○ Municipalities</li> <li>○ Communities</li> </ul>	Rehabilitate burnt areas <ul style="list-style-type: none"> <li>○ Same species</li> <li>○ Species change</li> <li>○ Watershed management</li> </ul>
Community Interaction <ul style="list-style-type: none"> <li>○ Awareness</li> <li>○ Education</li> </ul>	Fire Danger Rating System  Early Warning System	Community Response Plans	Fire cause investigation
	Legislation review and consolidation		Post-fire reviews and debriefs
	Roads and trail maintenance and construction		
	Water supplies		
	Community fire strips		
<b>STRENGTHEN ADAPTATION &amp; RESILIENCE THROUGH FOREST LANDSCAPE RESTORATION</b>			

# Forest Landscape Restoration (FLR)



- FLR can be an effective tool to increase forests' resilience and lower the negative impacts of wildfires.
- Ministers of Eastern and South-East Europe countries (including Turkey) pledged 4 million hectares on 12 October 2021.
- Forest fires are also significant source of GHG emissions and reduce the national carbon sink capacity
- Turkey recently ratified the Paris agreement.
- **What changes are needed in forest management to adapt to the new climate normal?**
- **What role will forests play in Turkey's low-carbon future?**
- **How can we help?**





# More World Bank Fire Management Projects

- [Belarus Forestry Development Project](#) will enhance silvicultural management and reforestation, increase felling residue use, and improve the public good contribution from forests
- [Forest Fire Prevention and Management – India](#) supported the creation of a Forest Fire Information Systems for fire prevention
- [Brazil Amazon Emergency Fire Prevention & Control Project](#) aimed to prevent and control large-scale wildfires in the southern part of the Brazilian Amazon through risk assessment, fire monitoring, prevention, and suppression
- [Brazil Forest fires prevention and management in the Brazilian Cerrado](#) supported an on-line system for the prediction of fire spread risk based on terrain, meteorological conditions, and monitoring of fire outbreaks
- [Croatia - Coastal Forest Reconstruction and Protection Project](#) restored and protected forest land to enhance the landscape including a comprehensive package of prevention, pre-suppression, and suppression forest fire measures
- [Indonesia – Cost of Fires](#) a report on the economic analysis of Indonesia's 2015 fire crisis, estimates that the 2015 fires cost Indonesia at least USD 16.1 billion (IDR 221 trillion), equivalent to 1.9 percent of 2015 GDP