European Commission

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Title: Preventing and fighting extreme wildfires with the integration and demonstration of innovative means

Specific Challenge

The Green Deal explicitly calls to “reduce the incidence and extent of forest fires”. It also calls “to boost the EU’s ability to predict and manage environmental disasters” as an immediate priority. Large-scale and more intense wildfires are becoming an increasing concern. More and more EU citizens suffer directly and indirectly from wildfires. Between 2017 and 2020, fires have killed hundreds and ravaged forests and Natura 2000 sites not only in southern Europe, but increasingly also in Central, Eastern and Northern Europe.

In addition to the extraordinary socioeconomic impact in terms of loss of human lives of residents and first responders, health, infrastructures and economic activity, extreme wildfire events have also serious and sometimes irreversible ecological impacts when considering soil and water degradation and biodiversity loss.

Moreover, wildfires are among the first contributors to climate change, with up to 20% of total global greenhouse gas emissions per year[1]. Furthermore, the large surfaces burnt cannot absorb so much CO_2 any longer, reducing the climate mitigation potential of carbon sinks. Extreme wildfires are now observed more frequently in higher altitudes and latitudes and further contribute to accelerating climate change by more black carbon fall-out on ice/snow and by melting of underlying permafrost.

In addition, large wildfires can increase air pollution over thousands of square kilometres, with a sharp increase in airborne fine particles and gaseous air pollutants.

Climate change, forestry change, ecosystem degradation and rural depopulation increase the depth and breadth of wildfires in the EU. Climate change is predicted to increase fire risk, with longer fire seasons, more frequent fires, new fire-prone regions and more severe fire behaviour.

[1] 7–16 Gt CO2-eq per year https://www.sciencedirect.com/science/article/pii/S1674927818300376

The burnt area in southern Europe during the 21st century would sharply increase - by 50% for a 2 °C global temperature increase scenario, by 100% for a reference climate scenario[2]. Extreme wildfire events as in Southern Europe in 2017-2018 and in California, Brazil and Australia in 2019 are likely to become common in Europe.

Scope

The new context of extreme wildfires requires **accelerating the shift towards a more holistic fire management approach** that integrates environmental, climate, health & safety/security, cultural and socio-economic aspects with:

- Research, demonstration and deployment of innovative means and methods tailored to extreme wildfire behaviour, such as better techniques, models, solutions and capabilities for preventing, predicting, monitoring and fighting wildfires, including better technologies and equipment for first responders.
- Proactive governance, large-scale and community-based risk assessments, awareness and preparedness - where citizens, local communities and the forestry sector play a central role.

The approach should be systemic: encompassing different climate scenarios, biogeographical/socio-economic contexts and means for faster and smarter management of all phases: prevention & preparedness (including forecasting), detection & response (including fire containment, extinction, potential evacuation and recovery) and post-fire restoration[3] & adaptation.

Innovative means and methods need to be developed, integrated and demonstrated on the field and tailored to geographical and socio-economic scenarios, with different types of fuels (e.g. forest/bush /peat fire threats), landscapes and biodiversity values (e.g. coastal/alpine/ agriculture/rural/Wild-Urban Interface) and scales (e.g. local/regional/national/cross-border/EU/international), etc.

The Research & Innovation Actions funded under this call will speed up the pan-European adaptation process to extreme wildfires by advancing and applying research and innovation including demonstration pilot sites while making best use of existing data (e.g. remote sensing, in-situ or community-based data), technologies (e.g. Big Data and Artificial Intelligence) and services (as Copernicus) and closely engaging and coordinating all concerned actors and communities for each phase.

[2] JRC's PESETA II Project: Climate Impacts in Europe (2014).

[3] Based on CBD guidance on ecosystem restoration https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-05-en.pdf

A. Prevention & Preparedness

The integration of environmental, climate and socio-economic conditions (including cultural heritage) with proactive governance (public and private actors), community-based risk awareness, prevention and preparedness activities can include among others:

- Develop an EU centralised database with socioeconomic and environmental information on wildfire causes and impacts with a focus on extreme wildfire events and the causes of wildfire ignitions (e.g. accidental and criminal causes) and the demographic trends (e.g. rural abandonment, recreational activities).
- Improve fire and landscape management of both public and private lands (including agricultural lands with innovative and sustainable approaches for fuel management, including community-based incentive programs for biomass reduction and new bio-economy value chains that maximise forest services and products whilst improving biodiversity.
- Enhance access to reliable fire danger rating and warnings in cooperation with existing EU initiatives (e.g. Copernicus services, EFFIS, with resolution tailored to the conditions), through upscaling the use of mobile apps and advanced cyber technologies.
- Support the integration of wildfire resilience into governance and insurance models.
- Improve the understanding of the link between the smoke exposure from fires and illness or death in local communities.
- Broad Earth System studies for biophysical feedback of global forest fires on climate - leading to new operational forecast climate-vegetation-fires models, using also historical wildfires records and paleoclimate evidence.

Build a common culture on risk prevention and preparedness across EU citizens, including local authorities and schools, through education and training, community involvement and awareness campaigns to encourage self-protection, safety and environmental protection, with special attention to mountainous communities and Wildland Urban Interface areas bordering forestlands.

B. Detection & Response

Anticipation and mitigation of high-impact events will benefit from research and innovation in space, aerial, ground, material and digital technologies, which should be integrated altogether with environmental, climate and social disciplines and existing EU initiatives on monitoring and suppression of wildfires.

Enhancement of the response capacity for safer and more effective operations can be demonstrated through improved data collection, elaboration and transmission, risk assessment and monitoring, wildfire detection, innovative early warning systems and digital infrastructure, aerial suppression/extinction of wildfires and evacuation planning, in a range of weather conditions and geographical scenarios. Activities can include among others:

- Measures to stimulate investments from private sector in new technologies for retrofitting and/or developing new detection & response technologies.
- Fast-track research and innovation in space and aerial means (e.g. satellites, pseudo-satellites, drones, high-volume water bombers, remote sensing systems, wireless sensors and early warning system …) for detection, targeting and/or extinction of fires.
- Enabling night operations, in particular for fire-fighting aircraft.
- More effective modular firefighting units fit for expedition in large cargo transport aircraft.
- More capable fire-fighting helicopters and planes, including tankers/water-bombers.
- Better scooping, tanking, discharging/nebulization systems for water, fire-retardants, etc.
- Develop better firefighter and ground/air vehicles' location and route management in real time, via space data, to guide and protect fire brigades and to respond efficiently to fires.
- Near real-time high-fidelity fire propagation forecasting (e.g. based on precise cartography, advance sensing of temperatures, winds, combustion modelling, machine-learning and supercomputing).
- Better training, including better flight simulators tailored to new extreme threats.
- Better and more interoperable incident management and communication, coordination and command systems, able to incorporate information from multiple

and non-traditional sources (for example social media data) and ensure interoperable communication in non-urban environments and across EU countries e.g. air-to-air, ground-to-ground and air-to-ground, exploiting satellite communication links for near real-time transmissions.

- Better integration of early warning systems, search & rescue and evacuation of persons and animals (protection areas, mobility, etc).
- Higher automation of operations and simultaneous safe operation of different aerial (and non-aerial) platforms in all conditions.
- Advanced personal protective equipment (i.e. smart garments, gear and breathing apparatus) for incident type (e.g. weather, comfort, protection).
- Devices to monitor the physiological signs of emergency responders.

C. Restoration and Adaptation

- Evaluate and upscale ecosystem-based restoration solutions and adaptation protocols for resilient wildland-urban interfaces and the opportunities of nature-based solutions.
- Sustainable post-fire restoration solutions of damaged ecosystems, supported by monitoring services and complementary geospatial analysis.
- Support the socio-ecological transition towards more resilient and sustainable communities.
- Define a common EU legal framework for the governance systems and operational activities regarding forest and communities protection from climate-related risks.
- Develop and test public-private cooperation mechanisms to leverage investments from the private sector, including insurance companies to stimulate the development of preventive measures and reduce loss and damages.

In line with the strategy for EU international cooperation in research and innovation, multilateral international cooperation is encouraged, in particular with United States, Canada, Australia, Russia, Brazil, South America, Indonesia, Japan and South Africa to leverage knowledge, resources and best practices, as well as to decrease risks and increase impact worldwide.

Expected Impact

Contribute substantially to the following targets by 2030 in Europe (with respect to 2019):

- 0 fatalities from wildfires.
- 50% reduction in accidental fire ignitions.
- 55% reduction in emissions from wildfires.
- Control of any extreme and potentially harmful wildfire in less than 24 hours.
- 50% Natura 2000 protected areas to be fire-resilient.
- 50% reduction in building losses.
- 90% losses from wildfires insured.
- 25% increase in surface area of prescribed fire treatments at EU level.

Activities should go beyond the state of the art and previous R&I activities at EU level[4], cooperate with ongoing relevant Horizon 2020 projects[5] and involve end-users from EU Member States / Associate States. Activities should make best use of existing EU initiatives and services (such as Copernicus'). The most promising results demonstrated may be up-scaled and deployed into:

- National climate change adaptation and disaster risk reduction strategies in line with EU policy guidelines and legislation, including forest and biodiversity-related strategies.
- The European Forest Fire information System (EFFIS) (including forecasts and risk assessments) and the Disaster Risk Management Knowledge Centre (DRMKC) Risk Data Hub, as well as the Knowledge Centres for Biodiversity and Bio-economy.
- Horizon Europe's Mission on Adaptation to Climate Change including Societal Transformation - with strong focus on citizen engagement.
- Union Civil Protection Mechanism (UCPM) and Emergency Response Coordination Centre (ERCC) [6] .
- Copernicus Emergency Management System (EMS) e.g. for Rapid Mapping, Risk & Recovery; Copernicus Land Service e.g. for monitoring changes in land cover and land use; Copernicus Atmosphere Monitoring Service e.g. for monitoring the intensity of fires

[4] FP7/Horizon2020/COST/JRC, LIFE and Civil Protection projects examples in Projects For Policy (P4P) Forest fires - Sparking fire-smart policies in the EU: https://op.europa.eu/en/publication-detail/-/publication/0b74e77d-f389-11e8-9982-01aa75ed71a1/language-en/format-PDF/source-91693190,
e.g. Firefighter Innovation Network FIRE-IN: https://fire-in.eu
EU Regional/Cohesion projects on forest fire protection and research and innovation
e.g. https://cohesiondata.ec.europa.eu/projects/row-2scn~y6qh_3fwi

[5] such as from calls LC-CLA-15-2020 and H2020 SU-DRS02-2018-2019-2020

[6] https://ec.europa.eu/echo/what-we-do/civil-protection/forest-fires_en

and forecasting pollutants propagation; Copernicus Security Service e.g. for support to EU external action; the Group on Earth Observations[7,8] and Galileo Emergency Warning Service.

- EU co-funded regional and interregional initiatives “promoting climate change adaptation, risk prevention and disaster resilience” e.g. to support regional civil protection infrastructures and units to prevent and fight wildfires.
- At international policy level, Sendai Framework for Action placing disaster risk reduction as a key element of sustainable development efforts.
- International standardisation bodies for international industrialisation of solutions, such as the International Forum to Advance First Responder Innovation (IFAFRI)[9] among others.

Budget: EUR X million (Horizon 2020 contribution). Potential leverage of funding from third countries and other EU programmes.

Timing (indicative): call for proposals opening in September 2020. Projects to start in Q4 2021.

[7] http://www.earthobservations.org/documents/gwp20_22/GWIS.pdf
[8] http://www.earthobservations.org/documents/gwp20_22/SPACE-SECURITY.pdf
[9] https://www.internationalresponderforum.org