



7th International Wildland Fire Conference

International Organizations Technical Report of the WMO, WHO, PAHO, IBBI and GFMC – An Input Paper to the Conference Statement

30 October 2019

Introductory Remarks

In preparation of their contribution to the 7th International Wildland Fire Conference, the World Meteorological Organization (WMO), the World Health Organization (WHO), the Pan-American Health Organization (PAHO) and the International Biomass Burning Initiative (IBBI), supported by the Global Fire Monitoring Center (GFMC), are taking the opportunity to highlight the impact of emissions from fires burning across the landscapes of the world on human health and security as well as on the atmosphere and climate. Brazil, as the host country of the conference, as well as the neighboring countries in and around the Amazon Basin are bearing a large variety of natural and fire regimes. These are ranging from recurrent fires in savanna-type of ecosystems, fires applied by farmers for cleaning fields and pastures, smallholders' traditional slash-and-burn shifting cultivation and fires used as a tool for converting native vegetation, including rainforest ecosystems, to agro-industrial land-use systems. In addition, wildfires, which are spreading uncontrolled from land-use fires, are affecting extended areas of fire-adapted and fire-sensitive forests, many of them resulting in damages on biodiversity, reduction of terrestrial carbon sequestration and overall loss of stability of fire-affected sites against secondary extreme weather or climate variability, such as extreme rainfalls or extended droughts that are increasingly related to the consequences of regional and global climate change.

All these different types of landscapes fires have one consequence in common – smoke pollution with adverse consequences on human health and security. The protection of human health against smoke by measures of avoiding unnecessary and excessive burning, fire prevention and appropriate fire and smoke management and other mitigation measures are crucial in other eco-zones of the world too.

The fire and smoke episodes of 2019 throughout the continents – from South America, to Insular Southeast Asia, Central Asia, Africa and Europe – were not unprecedented. However, in 2019 the smoke pollution and the high amount of land-use fires and wildfires depicted by satellite sensors alerted the public, the media and politicians around the world. This increasing public perception reveals an increasing sensitivity and vulnerability of people around the world. This has prompted the undersigned organizations to highlight the issue of landscape fire smoke pollution at global level.

Specific landscape fire problems of the host region

The Amazon basin is the world's largest tropical rainforest, spanning nine countries and an area of nearly 7 million km². It is home to more than 34 million people, and is one the most biodiverse regions in the world. It provides a wide spectrum of environmental services to local communities and equilibrium to the global ecosystem.

Wildfires, those uncontrolled, unwanted fires have been a constant problem in the region, especially during dry season and, during the exchange crops as part of agricultural practice¹. This issue threatening the health and well-being of the local population, including indigenous and tribal peoples.

UN Secretary-General Antonio Guterres said: "I'm deeply concerned by the fires in the Amazon rainforest. In the midst of the global climate crisis, we cannot afford more damage to a major source of oxygen and biodiversity". This adds to the voices of the Amazonian countries that have set the conservation of the Amazon as one of their priorities.

¹ FONSECA-MORELLO, THIAGO et al. Queimadas e incêndios florestais na Amazônia Brasileira: porque as políticas públicas tem efeito limitado? Ambient. Soc., São Paulo, V. 20, No. 4, p. 19-38, dez. 2017.



Landscape fires carry significant public health implications. Uncontrolled fires are a direct threat as many of the escape from planned burning and often evolve into a more complex emergency, through the potential of requiring voluntary or planned population movement (evacuation) affecting indigenous and tribal communities².

According to numerous studies, wildfire smoke has been associated with increased mortality, cardiac events, and a range of respiratory effects, including asthma attacks³. The most obvious consequences are respiratory conditions and subclinical alterations, characterized by reduced lung function in children and seniors. Several studies have indicated a high prevalence of asthma among school children in areas where wildfires occur. Local studies in Brazil have also indicated increase of patient visits in health units during the dry season; increased of hospitalizations for respiratory diseases among vulnerable population and an increase in mortality rate due to cardiovascular disease among elderly people.⁴

The health risk of human exposure to wildfires not only affects the local communities but also the urban population. Particles and gases from burning biomass can be carried over long distances, affecting air quality in regions far away.

Wildfires also release harmful pollutants including particulate matter, notably black carbon, and radiatively active gases such as carbon monoxide, nitrogen oxides, and non-methane organic compounds into the atmosphere and contribute climate feedbacks.

The European Union's Copernicus Atmosphere Monitoring System (CAMS) reports that the fires burning in the Amazon Basin released 255 megatons of carbon dioxide into the atmosphere from 1 to 25 August 2019. The recent Intergovernmental Panel on Climate Change's Special Report on Climate Change and Land stressed the importance of ensuring the decrease in deforestation and ensuring the sustainable land management. Fires emit carbon dioxide, whilst forest loss leads to the reduced uptake of CO₂ from the atmosphere, further fostering climate change.

Gaps / shortcomings in landscape fire science, management and policies

Strengthening planning, technological and communication tools is critical to reduce the vulnerability of people and landscapes to wildfires.

Advances in satellite technology make it possible to detect and monitor fire danger. Improving forecasting systems is important for predictions and warnings around fire danger and related air pollution hazards.

NASA's primary tool for fire detections since 2002 has been the [Moderate Resolution Imaging Spectroradiometer](#) (MODIS) instruments on the [Terra](#) and [Aqua](#) satellites. MODIS fire detections are analyzed by the [Global Fire Emissions Database](#) (GFED) project, which includes NASA Goddard, the University of California, Irvine, and Vrije Universiteit Amsterdam. Over the years, the GFED team has processed 17 years of NASA satellite data to better understand the role of fire for changes in the Earth system. Their analysis of the southern Amazon includes parts of Brazil, Peru, and Bolivia that typically see fires between July and October.

CAMS, which is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF), incorporates observations of wildfires from these instruments into its Global Fire Assimilation System (GFAS) to monitor the fires and estimate the emission of pollutants from them. It assimilates fire radiative

² Schwela, D. H., Goldammer, J. G., Morawska, L. H., & Simpson, O. (1999). Health guidelines for vegetation fire events. Geneva, Switzerland: World Health Organization.

³ Rappold, Ana G., Jeanette Reyes, George Pouliot, Wayne E. Cascio, and David Diaz-Sanchez. "Community vulnerability to health impacts of wildland fire smoke exposure." *Environmental science & technology* 51, no. 12 (2017): 6674-6682.

⁴ Rosa AM, E. Ignotti, Hacon SS, Castro HA. Prevalence of asthma in children and adolescents in a city in the Brazilian Amazon region. *J Bras Pneumol* 2009;35(1):7-13.

Farias MDC, Rosa AM, Hacon S, Castro HA, Ignotti E. Prevalência de asma em escolares de Alta Floresta - município ao sudoeste da Amazônia brasileira. *Rev Bras Epidemiol* 2010;13(1):49-57.

Rosa AM, Jacobson LSV, Botelho C, Ignotti E. Prevalência de sibilância e fatores associados em crianças menores de 5 anos de Cuiabá, Mato Grosso, Brasil *Cad Saúde Pública* 2013;29(9)



power observations from satellite-based sensors to produce daily estimates of biomass burning emissions, which are part of the extensive measurements performed by many stations of the WMO Global Atmosphere Watch (GAW) Programme. These measurements are essential for forecasts, research on atmospheric composition and to develop warning systems.

The Pan American Health Organization (PAHO) works closely with countries in the Americas to improve air quality levels and protect public health. In that regard, the Organization collaborates with the countries in the region towards the development and implementation of air quality objectives; the strengthening of local capacities to assess the burden of disease of air pollution; and increasing the health sector engagement on communicating the health risks of air pollution through strategies such as the Breathe Life campaign in collaboration with the Climate and Clean Air Coalition and UN Environment. Strengthening the capabilities of the health sector to have a leading role in air quality management is fundamental to protect public health.

In addition to this, the Organization supports countries response to emergency due to wildfires. In Bolivia, PAHO has supported the deployment of human and technical resources to face the wildfires crisis. Increasing the preparedness of health services for local communities in forest ecosystems is required to reduce to their vulnerability to the direct impacts of wildfires. Indigenous and tribal peoples located in the Amazonas frequently have limited access to health services making them more vulnerable to the effects of air pollution. There is also limited epidemiological surveillance for monitoring respiratory or cardiovascular diseases in this area. Such surveillance systems need to be implemented and in conjunction with early warning systems will allow reliable information that a public health department could act upon.

Main advances achieved since the last International Wildland Fire Conference

WMO

WMO has initiated a [Vegetation Fire and Smoke Pollution Warning and Advisory System](#) (VFSP-WAS). Arising from the keen interest of WMO Members in several impacted regions, the system provides guidance for addressing the issues of vegetation fire and smoke pollution.

Global monitoring and warning systems are complex. And as with any complex system, all the pieces of the Vegetation Fire and Smoke Pollution Warning and Advisory System need to be put in place before it is fully operational and achieve the goals set for it by the international community.

WMO has responded to urgent requests for assistance from Members in several impacted regions by initiating a [Vegetation Fire and Smoke Pollution Warning and Advisory System \(VFSP-WAS\)](#). The VFSP-WAS provides guidance for addressing both perils and proposes to support the potential foundation of regional centres on the topic.

Southeast Asia, one of the regions most affected by vegetation fires and smoke pollution, has established the first [Regional Vegetation Fire and Smoke Pollution Warning and Advisory Centre](#), operated by the Meteorological Service of Singapore. The region is currently in its wildfire season and their forecasts are providing up-to-date and timely information for people to protect themselves. The Southeast Asia Centre serves as a prototype for other centres to be established around the world.

The 18th World Meteorological Congress in June endorsed an ambitious plan to advance the integration of weather, climate, water and environmental applications and services for health, and work closely with the World Health Organization to prevent health risks. Populations both near and downwind of raging wildfires are keenly interested in receiving better warnings about the fires themselves and related air quality risk levels as both are serious threats to life and health.

IBBI

[Interdisciplinary Biomass Burning Initiative \(IBBI\)](#), organized by IGAC, iLEAPS, and WMO, coordinates international activities (e.g., interdisciplinary laboratory measurements and field campaigns that integrate ground-based and airborne observations, as well as detailed analysis of satellite data and numerical



modeling results) will help better quantify the present and future impact of biomass burning emissions on the composition and chemistry of the Earth's atmosphere.

The primary goal of IBBI is to improve scientific understanding of the various processes associated with open biomass burning in order to make atmospheric composition prediction and air quality monitoring and forecasting better. The initiative aims to achieve this by instigating new interdisciplinary research on biomass burning in a series of workshops. IBBI is thus science-driven and application-oriented. IBBI activities address five key topics:

1. Fire products (burned area, fire radiative power, emission factors, etc.);
2. Fire models and the representation of fires within models at different spatial scales;
3. Observations of fires, smoke and atmospheric composition;
4. The influence of fires on air quality; and
5. The link between fires and climate change

Wild and prescribed fires, agricultural burning, and open burning emit unique aerosol and gas phase pollutants to the atmosphere. The physical and chemical processes affecting the evolution of fire emissions are complex, and remain poorly understood. As a result, several recent and upcoming field and laboratory campaigns are focused on this topic, including: NOAA FIREX/FireLab; DOE BBOP; NASA FIREChem; NSF/NCAR WE-CAN; and JFSP FASMEE. Atmospheric models are indispensable tools for understanding and prediction of air pollution caused by biomass burning emissions. In recent years, a wide range of modeling tools have been developed to simulate fire behavior, biomass burning emissions, and their impact on atmospheric composition, human health and visibility.

Among a large number of online platforms offering information on global landscape fires, the following institutions provide information on landscape fire early warning including smoke pollution:

- [The Southeast Asia Regional Centre](#), operated by the meteorological service of Singapore, is already producing forecasts for ASEAN countries.
- Vegetation Fire and Smoke Pollution Warning and Advisory System (VFSP-WAS): [Concept Note and Expert Recommendations](#)
- Copernicus Atmospheric Monitoring Service – [Example Arctic Fires](#)
- [Global Fire Early Warning System](#) (GFMC / Canadian Forest Service)
- [Global Fire Early Warning Portal](#) (GFMC)
- [Global Wildfire Information System](#) (JRC)
- [GFMC portal on landscape fire emissions databases and other resources](#)

Proposals for solutions / action to be taken

From WMO GAW:

- WMO together with a number of partners proposes the establishment of the Vegetation Fire and Smoke Pollution Warning and Advisory System (VFSP-WAS) and to support the potential foundation of regional centers on the topic.
- More coordination between the involved UN Agencies and other international, regional and national organization are urgently needed.

From WHO PAHO:

- **Review and update** the WHO-UNEP-WMO Health Guidelines for Vegetation Fire Events (1999), incorporating a state-of-the-art framework to enhance public health response to wildfires in **support to institutional capacity of the health sector** for monitoring health risks, diagnosing and treating people affected by wildfires
- **Support health surveillance of air pollution and monitoring network:** examples could be: revision of the air quality standard according to the WHO recommendation; warning and emergency systems at critical times; areas that allow the registration of diseases that are related to air quality



- **Allocate funding to increase the capacities of the health sector** to effectively provide health services to local communities affected by wildfires and implement preventive actions. This should include provision of human and technical resources.
- **Promote Social participation and communication** to increase public awareness of the risks and preventable measures with emphasis on vulnerable groups, and **intersectoral debates** with different sectors, civil society and academia to nurture collaboration and elevate the importance of wildfire and health.
- **Support knowledge sharing of air pollution and health:** examples could be an inventory of fixed and mobile sources, public and real-time air quality data, **estimates of fires in pollutant emission inventories**, indoor pollution research to know the country's reality, mapping of carcinogenic emissions.
- **Strengthen leadership and coordination** through the formulation of a National Air Quality Policy integrated with various areas of government and actors (public and private) whereas air quality is a cross-cutting theme of transport, health, environment, urban development and mobility, energy, among others

Conclusions

- The issue of forest fires and their societal impacts is considered of great importance in WMO.
- Public health implications of wildfires are major and commonly overseen. Protecting indigenous and tribal peoples from the effects of air pollution from wildfires should be considering into the Integrated Fire Management.