



## 7<sup>th</sup> International Wildland Fire Conference

### Regional Statement of the Statement: Fire\$: Economic drivers of global wildland fire activity– An Input Paper to the Conference Statement

30 October 2019

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#### ***Explanatory Note or Introductory Remarks***

The following statement was inspired by a global expert workshop on “Global Fire Challenges in a Warming World” organized by IUFRO on behalf of the World Bank during the summer of 2018. During the workshop, beside traditional themes such as climate change and forest management, several discussions among fire researchers and managers revolved around the likely influence of economic factors on the current global pattern of landscape fires. Much anecdotal evidence points to the contributing role of international trade in agricultural commodities, the expansion of large industrial forest plantations and tree crops, and the economic structure of nations. Despite the seemingly obvious relationships between economy and fire activity reported by many observers, research and discussion on this topic have been more limited, with only a few publications introducing a restricted set of economic indicators, often over narrow spatial and temporal scales.

This statement describes the foundation for an international consortium of researchers, managers, and practitioners whose aim will be to examine the role of local-to-global temporal, spatial and economic dynamics (including non-monetary values/markets) influencing the occurrence of wildland fires across the planet as it warms.

#### ***Specific landscape fire problems of the region***

Research has shown that local to regional-scale land-use changes have been widely driven by macro-scale (i.e. national to international) economic forces, with nested levels of influence and intertwined dynamics whose analysis is highly dependent on temporal and spatial scales, as well as on the identification of the main stakeholders and the understanding of their potentially remote connections. The profound influence of economic globalization may interfere with national and local environmental policies, sustainable development strategies, and human security, thereby leading to environmental degradation, marginalization of rural/indigenous communities, social seclusion, and economic poverty through complex feedback loops.

Fire is a traditional land and vegetation management tool that is ‘low-cost’. Under the right environmental conditions, it can help with managing fuel loads of large areas of land, while providing nutrients to the soil and fostering ecosystem renovation. It has thus become a common, if not the most common, tool used for land conversion and management around the world, either as an initial clearing tool or as a maintenance tool. However, the inconsiderate use of fire combined to the occurrence of accidental wildfires might have severe effects on nutrient and water cycles and other ecological processes thus leading to environmental degradation and a sharp decrease in the provision of ecosystem services. Out of the ~450MHa burned on average every year in the world, most come from human-caused fires ignited for a variety of reasons such as forest clearing, soil preparation for crops or fodder, risk reduction, outdoor activities, socio-economic conflicts, arson, and accidents. The cumulative area burned resulting from those diverse social, economic, and geographic contexts makes fire one of the most important agents of land-use/land-cover change, often competitive with complementary tools such as mechanical treatment or animal grazing.

The relationship between land use/land cover change and landscape-scale fire activity has been described for a long time across a wide range of spatial and temporal scales. Whilst demographic drivers have received the majority of research studies seeking to understand the role of human populations in the observed levels of fire activity; including broadcast fires, prescribed fires, and wildfires, economic drivers have seldom been included and are often limited to the Gross Domestic Product. Although GDP is considered a valid proxy for the general understanding of global economic patterns, its correlation with fire activity is far from unequivocal, a case that points to other underlying factors not captured by a single global indicator. Furthermore, several local-to-regional pieces of evidence have pointed at the nexus



between the economic level of local populations, fire activity and effects on the provision of ecosystem services, and the global 'appetite' for international commodities (e.g. the exploitation of oil palm in Indonesia). This nexus occurs through large temporal and spatial scales and can be referred to as 'tele-coupling', which, in the context of this statement, suggests that economic drivers of global fire activity work transnationally and are often hidden within the movements of capital associated with resources, goods and markets. Thus, constructing meaningful economic indicators that can help describe the underlying processes and promote actions/decision-making is paramount. To date, however, there is no comprehensive assessment of the economic drivers of global fire activity, either as direct drivers linked to capital market systems/cash economies or as indirect drivers linked to the production of non-market values from ecosystem services, such as carbon sequestration.

Other economic drivers of landscape fire activity might be better perceived at a regional or local scale and linked to a diversity of underlying causes that are dependent on history (e.g., colonization), cultural practices and spiritual beliefs, land rights, existing fire management policies, and current political stability. Although ultimately tied to tele-coupling through top-down or bottom-up dynamics, change in the socio-economic structure of nations impacts local populations, especially indigenous peoples, often poorer, and limit their economic opportunities. When the use of fire leads to land degradation, especially when subsistence forests are targeted, the capacity to alleviate poverty may be further reduced. Conversely, countries where colonial fire management has reduced fire in landscapes and denied fire use as a central component of Indigenous people has reduced the production of ecosystem services the Indigenous subsistence economies rely on and forced them to become more reliant on Colonial western monetary cash economies. Indigenous burning was outlawed, and Indigenous had then to adopt western colonial labor jobs in extractive industries such as timber harvesting and fire suppression to survive and still live in their homelands/ancestral territories. They are now being among the poorest and most food and water insecure communities in countries such as USA, Canada, and Brazil.

On top of those many complex and still unclear relationships, ongoing global environmental changes pose new threats to environmental stability, economic development, ecosystem services, and eventually human security. One can envision that this "double exposure" of human societies to global change acceleration and economic globalization will modify the existing social-ecological relationships governing the current global pattern of landscape fires. Ever-growing fire suppression expenditures related to outdated fire-suppression narratives have created an "ecological fire debt", thereby deferring the risk and making the next fire more dangerous and costly to suppress and control. This shift in the timing and type of fire, combined with the introduction of fire in non-adapted socio-ecological systems, also creates long-term impacts on environmental and ecological values that we can't adequately measure at present from an economic standpoint, as a methodology remains to be developed.

### ***Gaps / shortcomings in landscape fire science, management and policies***

Over the next 50 years, such an approach to fire risk governance will make landscapes more hazardous and increase the vulnerability of society and Indigenous communities, as well as the ecosystem services they depend upon. Losses associated to increasing catastrophic fire activity are often driven by distorted economic incentives and ineffective/fragmented policies. In developed countries, residential development near and within fire-prone wildlands (i.e., the wildland-urban and rural interface) has been identified as one of the primary cause of rapid increases in wildfire-related losses and fire suppression costs incurred by governments. In developing countries, broadcast fires continue to be an inexpensive way to clear lands for commercial agricultural crops affecting ignitions despite existing regulation, while social and health costs associated to those practices, incurred at the individual level, result in significant economic burdens and the multiplication of impact per head dispersed among population.

While current and future global fire activity is the product of complex natural and anthropogenic interactions, we contend that the role of economic factors has been thus far poorly studied in comparison to ecological, climatic, and other human factors. Although these factors cannot be analyzed in isolation, looking at the problem from an economic standpoint will hopefully offer new and informative insights.



### **Statements for solutions / action to be taken**

This statement main focus is manifold: 1) reaching a better understanding of the global-to-local economic drivers of fire activity through time and space, 2) deciphering the bottom-up and top-down economic controls influencing variation in global fire activity, and 3) exploring the future of global fire activity according to future social, economic, and environmental pathways. This broad focus will allow for a diversity of discussion foci addressing one or many aspects of the problem at stake. These discussions will in turn help in defining a set of priority topics to be addressed according to specific temporal and spatial settings (e.g. global or local, over the past 10 years or in the future). Taking advantage of the large panel of knowledge and skills brought by the collaborators, the proposed work will explore a range of important topics:

- Identify the spatio-temporal relationships between global trade, national socio-economic profiles, and global patterns of fire activity, as well as the nature and the direction of those relationships. There is a particular interest in the consequences of afforestation for timber, agroforestry, and other tree plantation and forest-related products;
- Explore existing or potential links and feedbacks between fire activity and poverty, especially the poverty in Indigenous communities, how fire hinders and/or can increase the capacity of natural lands to alleviate poverty, and what the sustainable alternatives to the use of fire are;
- Identify and analyze existing bottom-up initiatives showing that local economies and their associated landscape management practices (e.g. agroforestry systems) can be sustainable and efficient at promoting non-burning agricultural practices, or at least sound fire practices (i.e., “good fires”), and forest health for economic stability/independence promoting security of human communities. “Prescribed grazing” in Europe, or “cool fire” burning by aboriginal communities (e.g. in Australia) are examples to explore. It seems important to explore the economic tradeoffs of the impact of fire use on the atmosphere and climate change, relative to the cost of promoting other potentially more climate-friendly land management strategies;
- Review the current state of knowledge, evaluate the efficacy of current environmental regulation and fire management policies with respect to this issue, list existing programs addressing the problem, and identify further beneficial actions (e.g., research, education, knowledge transfer, and cross-cultural fire stewardship). Specifically, a better understanding of the role of economic drivers relative to social, cultural, demographic, and ecological drivers could help design tailored outreach actions;
- Identify and evaluate the explanatory economic factors behind fire activity, the economic tradeoffs and synergies in the provision of ecosystem services linked to the use of fire, alternative land management scenarios (e.g. rural/wildland urban interface), and loss/cost saving options provided by fire exclusion, fire-use alternatives, and sustainable fire use in changing climate conditions. Note that these aspects will be highly variable depending on the geographic context.
- Design a number of future scenarios linking global environmental change, future global and national economic outlooks, and future human-made fire activity hotspots. For instance, the combination of worsening hydrological drought, forest landscape degradation, climate change and increased wildland fire potential will likely evolve in the future and be influenced by direct and indirect economic choices. Those scenarios will be shared with the scientific community in the hope it will trigger further research projects;
- Identify existing or to-be-developed indicators of “economically responsible fire practices or alternatives” that could be used as monitoring tools of industrial Best Management Practices and Corporate Environmental Responsibility. Specifically, if one considers that global trade creates leakage (‘export’) of fire activity, a ‘virtual fire trade’ embedded in the carbon market may engage governments and companies into better economic practices;
- Evaluate the tradeoffs and synergies of Indigenous “human services for ecosystems” associated with aboriginal/indigenous fire stewardship that maintains desired environmental and cultural conditions of fire prone ecosystems: are the costs of this type of land management strategy have increased with the advance of climate change? Are these tradeoffs really worth the cost of the CO<sub>2</sub> spilled into the atmosphere?
- Reach out to a number of stakeholders (i.e., industry, trading companies, governmental agencies, NGOs) and invite them to join a forum discussing solutions for better governance, planning, and education.



## **Conclusions**

The proposed work will provide a set of outcomes based on the extensive collection of knowledge from communities, practitioners, managers, and scientists. These are the types of outcome that are demanded by decision-makers across the globe, and structured collaboration on this highly salient and interdisciplinary issue. The products of this effort will hopefully feed into other global and continental environmental programs such as the Bonn Challenge, REDD+, and the Sustainable Development Goals. A better understanding of those multiscale economic drivers could also help national and international authorities to create appropriate environmental regulation where missing, as well as being used as an argument encouraging the industrial sector to better assess and develop their corporate social and environmental responsibility.

First and foremost, the main product of such work will be a solid network of professionals gathered around the collection and interpretation of relevant information on the topic, and a shared willingness to produce relevant material whose content can be mainstreamed into policy-making towards the achievement of the SDGs. The core product will be a state-of-knowledge report whose preparation will begin during the first year of activity.

This project has the potential for high-impact publications in high-profile scientific journals; ideally, a scoping review paper building on existing published material, and a research paper presenting a geo-statistical approach, will be prepared during the project. Complementary scientific work will be added as a function of the number of collaborators involved and funding available to pursue further questions. In parallel, the collaborators will ensure that the scientific process and the results are used for outreach purposes with the release of the state-of-knowledge report mentioned above, aiming to provide inputs to international policy processes and decision-making at various scales.

The collaborators will ensure that the work done under this statement is presented during international conferences and meetings, with institutions, managers, and practitioners as the audience to prioritize. The collaborators will also propose focused sessions to be held during conferences, potentially followed by the publication of a commentary summarizing the content of the presentations/discussions.

The statement will initiate the creation of three international databases recording different aspects of the economic drivers of fire activity. The first database will contain information regarding the 'virtual fire trade' and its carbon equivalent per country. The second database will contain information pertaining to international economic fire losses, from direct losses due to damages and destruction of structures and means of economic production to indirect losses due to the degradation of socio-ecosystems and the collapse of ecosystem services on a national basis. The third database will collect wildland fire management/firefighting expenditures on a national base. It is, however, important to underline that the creation of those databases will likely face hurdles, as data might not exist at all or might be retained by data holders if deemed too sensitive.

## **Recommendations**

The objectives laid in this statement can be divided in three levels of exploration/discussion in relation to the economic drivers of fire activity: a global-scale looking at the trade of commodities, a regional-scale looking at the economic profile of groups of countries (e.g. ASEAN, EU, NAFTA, OECD), and a local-scale (i.e. community) looking at people's economic dependence or relationship to surrounding landscapes (i.e., ecosystem services and benefits). We propose to address those three levels using a mix of outreach-oriented and research-oriented activities. At a global-scale for instance, tracking non-state driven transnational efforts, such as the Roundtable on Sustainable Palm Oil, and their effects can help identify the potential to reduce fires and the actions to reduce risk.

Outreach-oriented activities (OOA) will be first based on a number of general discussions involving all collaborators so the overall vision is well understood by everyone and ensure that planned endeavors of future nodes line up with the objectives of the proposed work. OOAs will serve to build nodes and collaborative teams, to convene external people and organizations, to identify stakeholder groups and boundary organizations, to further co-construct research questions with stakeholders and identify the degree of knowledge uncertainty where further collaboration would be most likely to promote actions (i.e.,



usable science or actionable research, cross-cultural and interdisciplinary knowledge applications), to work with the organizations and stakeholder groups to continue building shared goals, long-term relationships and effective communication between researchers, managers, community members, and stakeholders, which are the generally accepted principles of science coproduction. Regional nodes will thus use face-to-face and online meetings to collect knowledge in order to maximize the participation and engagement of stakeholders. Those meetings can be organized as (informal) focus groups during planned meetings/conferences where stakeholders and researchers already meet. Also OOs can further build on science co-production components by promoting Community based (local/rural) and Indigenous Fire Stewardship so fire management strategies are in alignment with social/cultural values, guarantee sustainable and profitable post-fire ecosystems services, and are ecologically and socially acceptable.

Research-oriented activities (ROA) will try to explore the complex aspects of the problem that will be prioritized through the OOs. The studies conducted by involved stakeholders will be highly data-driven and will thus take the greatest advantage of recent scientific advances in spatial statistics and time-series analyses based on artificial intelligence. Specifically, the recourse to spatially-explicit econometric analyses of the determinants of fire seems a promising avenue. Complementary economic analyses will also be designed if deemed necessary; notably, the possibilities offered by supply chain modeling in estimating “virtual fire import and export” in relation to carbon accounting. Researchers will stratify ROAs using the three levels of analysis proposed above. ROAs undertaken by collaborators will be made possible by the ever-growing availability of multiscale and high-resolution open-access datasets. The collaborators will make sure that the limitations regarding the use of materials or numbers produced by data-providing organizations (e.g. World Bank, FAO) are closely observed. Among the multitude of global or quasi-global datasets to explore, transform, and cross, collaborators will choose those whose content appear to be the most promising. Collaborators will focus on datasets providing information on wildland fire activity, supply chain, trade and market values, market and non-market valuation approaches for fire influenced ecosystem service production, carbon pricing, general economic indicators, and environmental accounts.