CFA Newsletter

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What's beer got to do with sustainable forestry?

Canadian foresters celebrate the link between beer and good forestry practice

I once worked with a visiting Finish researcher at our research institute in Canada. One night we were sharing beers and thoughts on how new ideas come into being. We were both computer geeks at the time trying to harness artificial intelligence (AI) to work on complex forestry problems, but we were failing. Our AI applications were unable to find innovative solutions like the human counterparts we modeled. His theory was that the human brain is a large neural network and new thoughts are formed when the links between neurons are broken, something alcohol does, and new pathways between nodes are found. We tipped our glasses back justifying our beer consumption as work product that would hopefully provide a solution the next morning to our struggling AI system.

At the time we did not realize innovation in forestry and beer go a long way back. German beer purity laws, *Reinheitsgebots*, interestingly originated in the same area of the world where sustainable forestry emerged as a concept. Morgenstern (2007) noted the concept of sustainability, *Nachhaltigkeit*, emerged first as regulations for forest inspections and volume estimates in Bavaria by the 16th century. The principle of sustainable management followed and was incorporated in all Austrian and German states by the 19th century. These forerunners developing our modern sustainability concepts were perhaps influenced in their pure thinking by drinking pure beer as regulated by the Bavaria beer purity law of 1516.

In Canada, when I attended forestry school in the early 1980s, there wasn't a beer purity law. But in the early 1980s my classmates' choice in beer was limited, ale or lager with maybe one or two national brands to chose from. Like our beers, Canadian forestry was also rather simple. Our professors taught us

Forest Scenes

Global Vegetation Fire Challenges and Outlook

In many parts of the world areas at high wildfire risk are contaminated by the heritage of armed conflicts and industrial or nuclear accidents. In Europe large tracts of lands are contaminated by unexploded ordnance stemming from the World Wars and other more recent armed conflicts. The high risk of injuries and deadly fatalities due to uncontrolled explosions or intake of radioactive smoke or dust particles require specialized equipment to protect fire management personnel. This specialized wildfire suppression tank, operated by a German company on UXO-contaminated lands in Brandenburg State (around Berlin), is a converted T-55 combat tank with unchanged armor. It allows safe application of 11,000 liters of water and water additives for fighting dangerous fires. This kind of technology should be used on radioactively contaminated terrain in places like Russia, Belarus and Ukraine (e.g. in the Chernobyl Exclusion Zone). Photo: GFMC/DiBuKa.

Profile of Global Fire Challenges

Every year, roughly an average of about 600 million hectares of vegetated lands is affected by land-use fires and wildfires (Mouillot and Field 2005). Worldwide, wildfires are trending toward longer burning periods, heightened severity, greater area burned and increased frequency. Consequences include detriment to environment, socio-economic costs including threats to human health and security, and higher shares of emissions into the atmosphere. Conversely, due in large part to human activities such as expanding infrastructure, industrial activities, or mismanagement of fire, fire

regimes are shifting dramatically and creating positive feedback cycles in sensitive ecosystems, notably in the Arctic tundra (Mack *et al*. 2011), in peatlands (Page *et al*. 2002), and in tropical rain forests (Cochrane and Laurance 2002). Sensitive, non-fire-adapted areas can contain highly concentrated carbon stocks, which are rapidly released during fire events with devastating consequences both locally and globally. For example, fires burning in Indonesia alone, during the El Niño dry season in I997 and 1998 produced an equivalent of up to 40% of the *global* gross carbon dioxide (CO_2) emissions from fossil fuels for that year (Spessa, 2013). The Indonesian haze crisis this past year often put up daily CO_2 amounts higher than the entire European Union industrial economy (Huijnen *et al*., 2016). Globally, emissions resulting from vegetation fire can constitute one-third of total releases of carbon dioxide annually (Page *et al*. 2002). The National Disaster Mitigation Agency (BNPB) of Indonesia, estimated the damages to the national economy caused by fires in 2015 amounted to US$16.5 billion, or around 1.9 percent of the country's GDP; to put a price tag on fires globally is impossible. In addition to the environmental and economic impacts, a humanitarian dimension is growing with some models indicating the annual average number of premature deaths resulting from vegetation fire smoke exposure, range between 180,000 (Lelieveld *et al*. 2015) and 339,000 (Johnston *et al*. 2012). While much emphasis is placed on the negative effects of fire – in many instances more fire is exactly what is needed to reduce some of these consequences. For example, applying "prescribed fire" in fire-adapted environments can contribute to lowering the severity of wildfire events which can wreak havoc on communities in the wildland urban interface (WUI), where measures have not been taken to reduce fuel buildups.

Political Challenges

Political challenges facing fire managers range from the sensationalized affair of protecting celebrity mansions in Hollywood Hills, to coordinating firefighting efforts between two warring countries when border-crossing fires threaten villages. Fire managers and policy-makers from the local to the supranational, are tasked with addressing the contribution of vegetation fire emissions to climate change, the application of fire in land-use change, accumulating effects of global change on fire regimes, and increasing impacts of fire on society, notably on human health and security. Additional challenges include the role of vegetation fires on environment and humans, stemming from collateral damages of armed conflicts and impact on contaminated terrain including industrial, unexploded ordnance and radioactivity; fire-induced immediate threats to human health and pre-mature mortality through fire-smoke pollution, and on and beyond agricultural systems (e.g. trans-boundary impact of agricultural fires causing long-range transport and deposits of black carbon on the Arctic ice) (IWFC, 2015).

Political implementation of these approaches is largely an exercise at the science-policy interface, where actors, activities and institutional arrangements are working to engage in and support the transfer of science and expertise upwards into policy mechanisms and downwards into implementation strategies feasible for practitioners. These mechanisms in large part are voluntary and non-binding. An example is the International Wildfire Preparedness Mechanism, which aims at enhancing national to international fire management capacities by sharing of knowledge and expertise (IWPM, 2016). Another approach is bilateral agreements, several of which have been reached, like between the United States and Canada, or Australia; some have

worked quite well, but more on the grounds of exchanges in expertise and political goodwill. The Association of Southeast Asian Nations (ASEAN) Haze Agreement to combat trans-boundary haze from fires is the globe's only multilateral binding agreement to do with fire – yet it remains an example of political progress without problem solving – evident during this past year's repeat of the 1997–98 crisis in Indonesia. Importantly, it goes to show that fire politics and challenges must be addressed at more than one level and (supra)national efforts must also work in concert with actions and activities at the lowest, local level, which include everything from navigating conflicts of interests and corruption, to local law enforcement, building capacity and supporting community-led fire management.

Opportunities and Initiatives

A recent development towards addressing global fire concerns is the effort to establish a number of additional fire management resource centers in regions of the world including South America, Sub-Saharan Africa, South Asia and Southeast Asia. Like the currently operational centers in Southeast Europe (based in FYR Macedonia), Eastern Europe (Ukraine) and Central Asia (Mongolia), these centers are to expand local to international cooperation and response mechanisms, facilitate cross-sectoral communication and exchanges of information and technical and scientific expertise, facilitate training programs and especially enhance local and regional capacity by promoting principles of Integrated Fire Management (IFM). For instance, the Regional Central Asia Fire Management Resource Center in Ulaanbaatar, Mongolia, plays a critical role in addressing increasing demand for collection and distribution of data and information relevant to fire management among local stakeholders and regional neighbourhoods; it is facilitating capacity building at regional level, and supporting the exchange of human and technical resources. To enhance capacity and participation in fire management of civil society, notably local rural communities, the Center is also conducting community-led fire management trainings. Most importantly the center is facilitating national inter-agency coordination in fire management and the cross-boundary cooperation dialogue within the neighbouring countries of Central Asia.

Challenges rooted in cultural norms such as the use of fire as a land conversion tool, are most effectively dealt with locally. Participatory Community-Based Fire Management (CBFiM) incorporates indigenous knowledge and thousands of years of human experience in the benign use and balanced application of fire to support ecological and human needs. CBFiM objectives include creating awareness for dangerous burning conditions, enhancing capacity to contain escaped burns, and thereby reducing the number of livestock and human casualties, instances of lost dwellings and agricultural crops, and lesson the occurrence of large uncontrolled fires that release large amounts of emissions. Regional Fire Management Resource Centres like the one planned for Indonesia (serving SE Asia) will be bridging the science-policy interface to, through principles of good governance, build on success models from other regions, but specifically suited for addressing the high level of stakeholder conflicts (e.g. between smallholders and multinational palm oil and paper pulp corporations), land-use and property rights challenges, and also recognizing the sensitive and globally valuable ecosystem at stake. The Indonesian government, including its newly formulated Peat Restoration Agency stand ready to partner on these critical challenges; an emissions forecasting, early warning, and fire prevention center is also in its formative stages. Working in tandem with these initiatives, a regional

resource center, which functions both horizontally and across the three levels of local, national and regional governance structures – is anticipated to prove as effective and valuable as it's other regional predecessors have.

Globally most emphasis in fire management is given to the empowerment and capacity building of local rural communities. By taking over responsibility for the management of community forests and other lands local communities shall assume a key role in the prevention and suppression of wildfires that may threaten rural assets, including forests, agricultural lands, villages and critical infrastructures. Capacity building in fire management includes the safe application of fire in land-use systems and wildfire hazard reduction. The photograph shows Nepalese villagers training prescribed under-canopy burning and surface fire suppression with hand tools – an example of outreach work of the UNISDR Regional South Asia Wildland Fire Network. Photo: GFMC/Sundar P. Sharma.

Outlook

Mutual gains can be achieved by supporting and participating in current, emerging, and planned initiatives which fall under the scope of IFM, and contribute to realizing Sustainable Development Goal 15[1] and to the challenges of the Sendai Framework for Disaster Risk Reduction[2]. The persistent challenge of fire managers is to manage fire to support the long-term biological integrity of any given landscape, while accounting for the negative consequence of fire and yet meeting diverse human needs. In many instances more ecologically benign fire is both effective and highly constructive; scientists in northern Australia are even showing from an emissions modelling standpoint that applying

[1] SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (UN, 2015b).

[2] By outlining clear targets and priorities, the Sendai Framework for Disaster Risk Reduction 2015–2030 aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years. The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on 18 March 2015 (UN, 2015a).

Aboriginal early-dry-season savanna burning techniques, result in fewer emissions and increased carbon sequestration over time, while simultaneously rejuvenating the ecosystem for plants, animals and human use (e.g. grazing) (Russell-Smith *et al.* 2013). In General, emphasis is needed on prevention over suppression, and in fire-adapted climates, the best approach to prevention is increasing the use of prescribed fire – a less-intensive and less ecologically damaging alternative to mostly human-caused, climate and drought driven out-of-control fires. Aside from better prevention and increased early warning mechanisms, fire management should be better integrated into initiatives like Reducing Emissions from Deforestation and Degradation (REDD+) or those offered by the Global Environment Facility (GEF) and Green Climate Fund; fire management capacity should be bolstered at local, national and regional levels. These institutional arrangements, activities and initiatives can best be supported through regional centers of excellence, where committed individuals, over time, and with the support of governments and organizations, can manage and relate to fire sustainably. Building effective institutional arrangements, networks of people, and integrating best practices and sound science into windows of opportunity in the policy process, while empowering local communities, may be the best steps we can take to ensure that globally fire is fulfilling its ecologically benign role, while limiting its destructive impacts and occurrence in sensitive environments. Ultimately, fire must be understood as much as a social challenge as one that is environmental.

The Global Fire Monitoring Center (GFMC) is an institution of the Max Planck Institute for Chemistry, Max Planck Society for the Advancement of Science, hosted by the Freiburg University, Germany. Since 2005 GFMC is an Associated Institute of the United Nations University (UNU). Since 2001 GFMC is serving as coordinator and facilitator of the UNISDR Wildland Fire Advisory Group and the UNISDR Global Wildland Fire Network, a global voluntary network that is providing policy advice, and science and technology transfer to enable nations to reduce the negative impacts of vegetation fires on the environment and humanity; and to advance the knowledge and application of the ecologically and environmentally benign role of natural fire in fire-dependent ecosystems, and sustainable application of fire in land-use systems.

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