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Training in prescribed burning, Hetauda, Makawanpur, Nepal. Photo: Sundar Sharma

Challenges in forest fire management in the Himalaya: experiences from Nepal

Sundar Sharma and Anil Pokhrel

"Participatory, community-based approaches to improve fire management are imperative."

Introduction

In Nepal, fire is used as a traditional tool for clearing and managing agricultural and pasture land. It is also used to facilitate gathering non-timber forest products and in hunting and herding. An analysis revealed that 58% of all forest fires were deliberately set, followed by negligence (22%), and accidental (20%) (Sharma 2010). Moreover, the country's diverse climatic conditions, vegetation, ecosystems, and socioeconomic and cultural settings result in a wide range of land use systems and diverse fire regimes and vulnerabilities.

Fires are a regular occurrence during the long and intense dry season, and have serious impacts, causing both ecosystem degradation and deterioration of already vulnerable social and economic conditions, especially in fragile Himalayan ecosystems. Forest fires destroy timber and non-timber forest products, reduce biological diversity, degrade soil

(inducing soil erosion), and increase the risks of floods and landslides. The haze from fires has also resulted in the closure of schools and airports and affected the country's important tourism industry. There is, however, no systematic collection of data on fire impacts on wildlife, medicinal plants, health, or on weather and climate from atmospheric brown clouds; the same is true in the South Asia region as a whole.

Each year in Nepal, on average, 200,000 hectares of forests are burned during the fire season from mid-November to May; 8 people die, 6 are injured, and 88 houses are destroyed (Bajracharya 2002). The number of reported fires varied considerably from 2012 to 2021, however (Figure 1), reaching an unprecedented level in the 2020–21 forest fire season, with 6,799 fires reported — ten times more than the previous season and three times more than the average in the previous eight years. The occurrence of forest fires is increasing, at least in part as a consequence of regional warming and extended dry spells (Sharma and Goldammer 2011) and of growing aridity and hydrological changes (NCVST 2009). There were many forest fires in March 2009, for example, causing huge plumes of smoke (Figure 2).

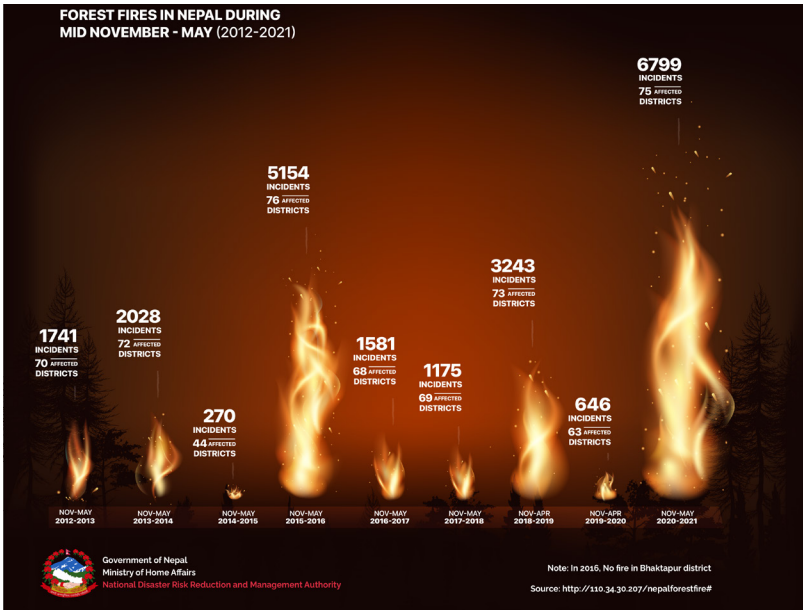

Figure 1: Number of forest fires in Nepal, 2012–21. Source: DoFSC/ICIMOD 2021

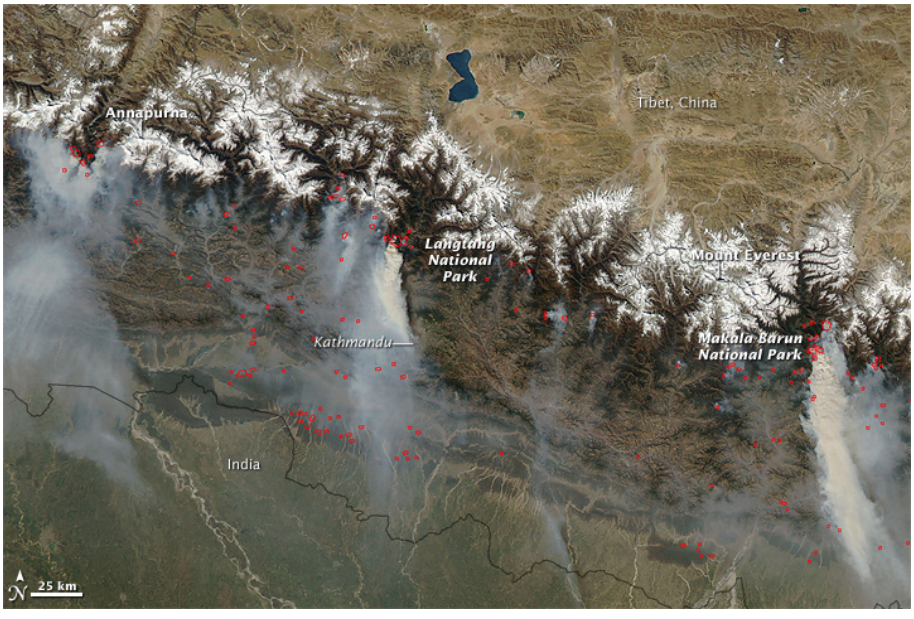

Figure 2. Large forest fires in Nepal on 12 March 2009. Source: NASA Earth Observatory

Participatory planning for forest fire management in community forests. Photo: Sundar Sharma

Climate change interactions

Forest fires release particulate matter and gaseous emissions, causing atmospheric brown clouds, which are a major driver of regional climate change. The processes involved in the transport and chemical composition of smoke plumes associated with wildland fires are known, but further research is needed to enhance understanding of the fundamental fire-fuel-atmosphere interactions that govern plume behaviour. This behaviour is determined by fuel characteristics, fire behaviour, emissions, canopy structure, fire-induced and ambient turbulence, and basic atmospheric conditions (Heilman et al. 2014).

Nepal has the eighth highest per-capita rate of CO_2 emissions among least developed countries, primarily because of deforestation. Recent research suggests that if forest fires continue to increase, this could significantly increase glacial melt rates in the Himalaya, both by increasing the deposition of soot on glacial surfaces (reducing albedo) and by releasing aerosols into the middle troposphere (warming the atmosphere). The link between decreased albedo and increased snowmelt is well established, but the links between aerosols, middle troposphere warming, and glacial melt rates are more tenuous, although aerosols have been isolated as a likely contributor (Ramanathan et al. 2007).

Local initiatives

Community involvement has proved to be successful for sustainable resource management, and community-based fire management (CBFiM) could be the key to overcoming the recurring problems of forest fires. In Nepal, with no national forest fire management plan or programme until 2010, community forest user groups try to control fires in their own forests, despite a lack of planning, proper training and equipment. There is also a lack of local and national capability in fire management, including research, monitoring, early warning, assessment and facilitating cooperation.

One example of how to address these issues is the Three-Level Wildland Fire Management Project, which developed and implemented a district-level forest fire management plan, along with training of community forest user groups and local government members. It was implemented in Makawanpur District in 2007 by the Department of Forests (DoF) and the Global Fire Monitoring Center (GFMC) and was supported by the German government.

National level

The country's first forest fire management strategy was drafted during a national consultative workshop in Kathmandu, and after stakeholder consultation, it

was approved by the Government of Nepal in 2010. Responsibility for fire management fell under the National Disaster Risk Reduction and Management Authority (NDRRMA), which was established in 2019 under the Ministry of Home Affairs to protect human lives and property, to act as a central resource body, and to formulate national disaster management policies and plans. Responsibilities then cascade down to provincial, district and local levels. State disaster management committees under the chairmanship of the chief minister approve variation of the national plan depending on context. There are also 77 district disaster management committees coordinated by the chief district officer. At the local level, there are disaster management committees in all 753 municipalities.

NDRRMA is responsible for forest fire risk reduction and management. It received a significant budget for 2021–22 to undertake activities and programmes that will form the components of and basis for a comprehensive national strategy. These include training in forest fire awareness and risk reduction, design of comprehensive training curricula and e-modules on integrated forest fire risk management (in English and Nepali), and procurement of firefighting tools and equipment (hand tools, robotic firefighting equipment and fire trucks). In addition to training and providing equipment, activities include the revision of the 2010 forest fire management strategy, forest fire damage and loss assessment and risk evaluation, development of air pollution disaster management, and forest fire resilience action plans.

A great step forward in national fire assessment was the Forest Fire Monitoring and Detection System. It provides real-time information on the occurrence of and extent of damage caused by fires, and sends SMS messages and emails to concerned officials across the country (DoFSC/ICIMOD 2022). Operational since 2019, it was developed by the Department of Forests and Soil Conservation (DoFSC), with technical support from the International Center for Integrated Mountain Development (ICIMOD). With the help of fire risk zone maps and other fire monitoring tools, managers can now easily track fire-risk areas and develop fire management strategies (Figure 3). This has enabled efficient and effective decision making to minimize fire risk, such as allocation of resources to areas where they are needed.

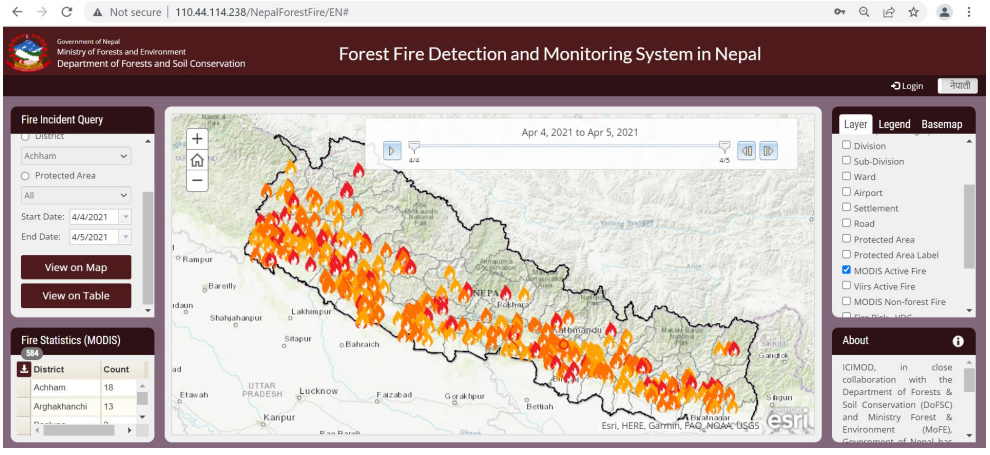

Figure 3: Forest fire detection and monitoring web tool, showing 584 fires detected on 5 April 2021. Source: DoFSC/ICIMOD (2021)

Regional initiatives

After the foundation of the regional South Asia Wildland Fire Network in 2007 (Sharma 2007), regional consultations were conducted in Nepal in 2012 and in 2016 on the development of a cohesive local-to-global fire management initiative: the Regional South Asia Wildland Fire Network (GFMC 2017). These consultations resulted in the following ten shared conclusions and recommendations, which are in various stages of realization:

- develop/strengthen national institutional bases for fire management, including national inter-agency coordination mechanisms, and academia and civil society groups;
- create/strengthen national fire management advisory committees under a government-based secretariat or a national fire management coordination unit, to convene national stakeholders in fire management and to develop national fire management policies;

Sharing experience in the field during the 2012 Regional Pan-Asia/Pacific consultative workshop in Nepal. Photo: Sundar Sharma

- establish an integrated fire management finance mechanism, to include financial resources from national sectoral budgets and international sources;
- provide adequate insurance for those involved in fire management (professionals, volunteers, community members) in case of injury or death;
- establish a Fire Management Resource Center in the South Asia region to provide monitoring, documentation, analysis, capacity building and advisory services in fire management;
- develop/enhance transboundary cooperation among South Asian countries within the UNISDR Regional South Asia Wildland Fire Network and the Pan-Asia Wildland Fire Network, for information and technology sharing, joint training, and improving preparedness and inter-agency operations for effective responses during wildfire emergencies;
- translate the EuroFire Competency standards and training materials into the main South Asian languages, and contribute to the finalization of the International Fire Aviation Guidelines and Manual of Common Rules for Fire Aviation, and consider their approval and application;
- consider implementation of the recommendations of previous regional and international meetings, conferences and summits;
- encourage Asia-Pacific countries to develop bilateral and multilateral projects and programmes to enhance fire management capabilities; and
- encourage active participation in dedicated thematic networks, including annual meetings and activities of the Pan-Asia Wildland Fire Network, the Global Wildland Fire Network, International Wildland Fire conferences, etc.

In addition, in the Asia-Pacific region, several expert consultations on the future needs of forest fire management have been held among the Regional Wildland Fire Networks of Asia (e.g. Sharma 2009) under the auspices of the UNDRR Global Wildland Fire Network (GFMC 2017).

Moreover, as a member country of the South Asia region, Nepal has continuously been involved (both as a trainer and trainee) in forest fire management training programmes organized by the Asian Forest Cooperation Organization (AFoCO), in cooperation with the Global Wildland Fire Network, since 2014. The programmes are mainly focused on fire safety and behaviour, fire prevention, fire inspection, fire information systems and fire suppression where community-based fire management is a priority.

Regional consultative workshop on cross-boundary cooperation in fire management in South Asia, Kathmandu, Nepal, 2016. Photo: Sundar Sharma

Conclusions

Nepal faces challenges in forest fire management that are aggravated by climate change, and there is an urgent need for financial, institutional and technological resources and for capacity development to effectively implement fire management. The problems of forest fires in the region are complex, and cannot be addressed at a single sectoral level. To overcome the country's limited capacity in fire management, there is a need to strengthen the human and technical resources of agencies and local communities that deal with fire prevention and response. In addition, transboundary cooperation in fire management is needed to share the most appropriate knowledge of advanced approaches in fire management. For this reason, a system of exchange of expertise in fire management between countries globally has been established: the International Wildfire Preparedness Mechanism (IWPM).

Policies and legal arrangements related to forest fire management include the Forest Fire Management Strategy 2010, National Disaster Risk Reduction Policy 2018, Disaster Risk Reduction National Strategic Plan of Action 2018–2030, Disaster Risk Reduction and Management Act 2017 and Regulation 2019, Forest Act 2019, and the Private House Reconstruction and Rehabilitation Relief Procedure damaged by Fire 2022. However, there are inadequate financial, institutional and technological resources and capabilities to effectively implement these measures. The National Disaster Risk Reduction and Management Authority (NDRRMA) coordinates disaster management, and the Ministry of Forests and Environment (MoFE) coordinates forest fire management, but there is no dedicated unit to deal with forest fire disaster risks.

The establishment of a Fire Management Resource Center for the South Asia region is recommended, to be hosted by NDRRMA in Nepal. This would coordinate with international institutions and provide monitoring, documentation, analysis, capacity building and advisory services in forest fire disaster risk reduction and management, and promote principles, norms, rules and decision-making procedures within an agreed guiding framework. It would enhance and strengthen bilateral, multilateral and international cooperation in wildland fire management, create synergies and share knowledge, technical and human resources among countries.

Local communities will benefit, first from reduced fire occurrence and severity. Participatory, community-based approaches to improving fire management are imperative (Sharma and Goldammer 2011). The proposed regional centre would strengthen local communities' capacity to cope with forest fires by helping them to address the consequences of climate change and fires that affect their livelihoods. When assisting countries in fire management planning, coordinated and collective action, and enhancing institutional and technological capabilities, emphasis will be placed on community-based fire management approaches, and on promoting education and awareness-raising programmes on fire prevention.

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