Social Factors in Wildland Fire Risk Management and Planning

David Martín Gallego, Eduard Plana Bach, and Domingo Molina Terrén

The socio-environmental dimension in wildland fire management is critical for moving towards a baseline of firewise planning. Wildland fire risk planning is a land use planning tool that should be able to keep pace with rapid rates of social and environmental change. Changes in land use and climate bring alterations in fire regimes, aggravating and diversifying the range of associated impacts and leaving a vulnerable society unprepared to take on a magnitude

David Martín Gallego is a doctoral research assistant at the Fire Safety Engineering Group of the University of Greenwich, London, United Kingdom; Eduard Plana Bach is Head of Forest Policy and Environmental Governance for the Forest Sciences Centre of Catalonia, Solsona, Spain; and Domingo Molina Terrén is a professor in the Department of Vegetal Production and Forestry Science at University of Lleida, Lleida, Spain.

> Successful wildfire risk management requires good governance and societal and institutional involvement in management decisions.

of risk. Extreme fire behavior is appearing even in areas not historically affected by severe wildfires. Success in adapting to increased risk can depend on social factors such as fire risk perceptions, social capacity to accept risk, and identification of social actors (decision makers, urban planners, firefighters, researchers, and the like) who can rise to the challenge of land management planning as a crucial aspect of wildland fire risk management. Moreover, societal and institutional involvement in management decisions is required for participatory risk governance. The vulnerability of urban

settlements and infrastructure at risk can be attenuated by developing hazard mitigation strategies to create more resilient landscapes and communities. For example, a combination of agroforestry and livestock activities will yield a landscape mosaic. This, along with the social capacity to take protective measures in wildfire prevention as well as in emergency situations, will contribute to reducing overall community vulnerability (fig. 1).

What are the key social factors at play in developing sound hazard mitigation strategies?
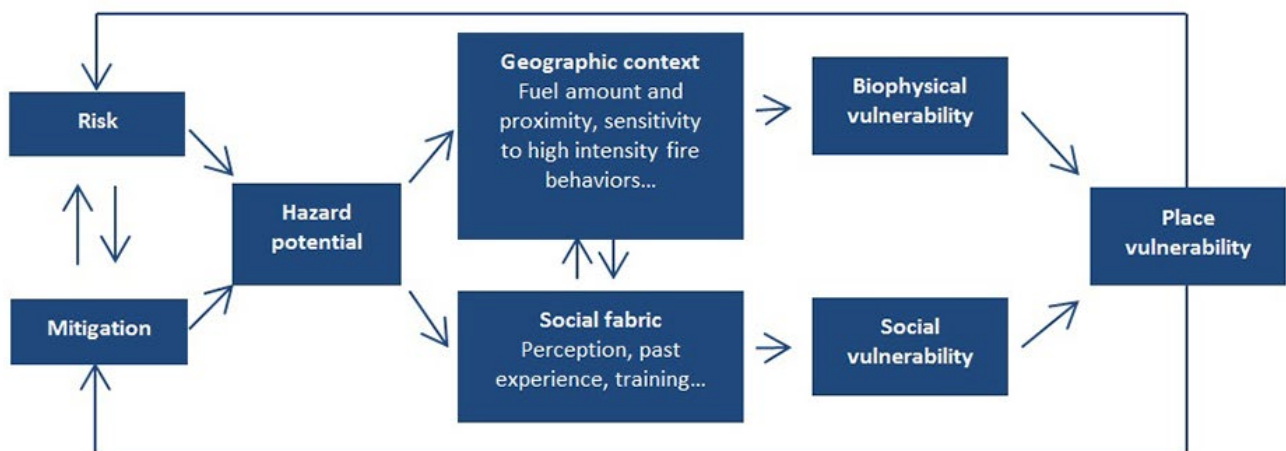

Figure 1—*Hazards-of-place model of vulnerability. Hazard potential is affected by a geographic context leading to biophysical vulnerability (site and situation of the place) and a social fabric leading to social vulnerability (the population at risk). The combination of both results in the overall place vulnerability, a dynamic factor influenced by the level of risk, the implemented mitigation strategies, and the hazard potential. Source: Adapted from Cutter (1996).*

Risk Management in the Wildland–Urban Interface

Because large wildfires are rare, wildland fire professionals should focus on the latent risk over long timespans, making sure that both citizens and policymakers remain aware of the risk. Fire is often excluded in the wildland–urban interface (WUI), with little or no thought given to the role of fire as a natural component of the ecosystem. In rural settings, the traditional use of fires is maintained to some extent but also increasingly excluded due to the rising risk of wildfire spread. The WUI is one of the most controversial and challenging issues for wildfire suppression and emergency services. People living in WUI areas need to assume some responsibility for protecting their property but usually remain unaware of how fire behaves and what mitigation actions are available (Blanchard and Ryan 2007).

Learning to live with fire appears to be the most effective strategy all across the world. Designers, developers, and builders working with structures in WUI areas have the opportunity to offer residents a home designed and constructed with firewise features (fig. 2). Firewise planning is a valuable service that landscape architects and designers can offer to homeowners, addressing needs in two areas: the structure (thinking about homes as fuels) and the area around it (offering

> Learning to live with fire appears to be the most effective strategy all across the world.

a defensible space). Building and forestry technical codes for future developed areas should take into account:

- The radiant heat of an approaching wildfire, prescribing an adequate distance between vegetation and buildings; and
- The potential for spot fires near houses and infrastructure.

Planning for wildland fire protection in the WUI should also incorporate suitable access for suppression services as well as for the safe evacuation of residents. Public officials with authority to approve planning documents can review the technical instructions in order to convert them into mandatory technical regulations.

Factors Affecting Attitudes Towards Risk Mitigation

Psychological variables related to public beliefs and attitudes affect public support for wildland fire management strategies (Absher and Vaske 2007). Martin and others (2007) summarized the main factors as follows:

- The perceived effectiveness of actions to reduce the risk,
- Confidence in the capacity to correctly carry out actions,
- The perceived responsibility for fire risk management, and
- Trust in and the credibility of the institution that is calling for action.

Better public understanding of the role of fire in ecosystems will foster long-term cross-sectoral strategies based upon fuel management at a landscape level. Better knowledge of risk exposure will promote a public desire for self-protection and shared responsibility. Social factors, such as people's perceptions, beliefs, and attitudes toward fire impacts, play a decisive part in the success or failure of fire management programs.
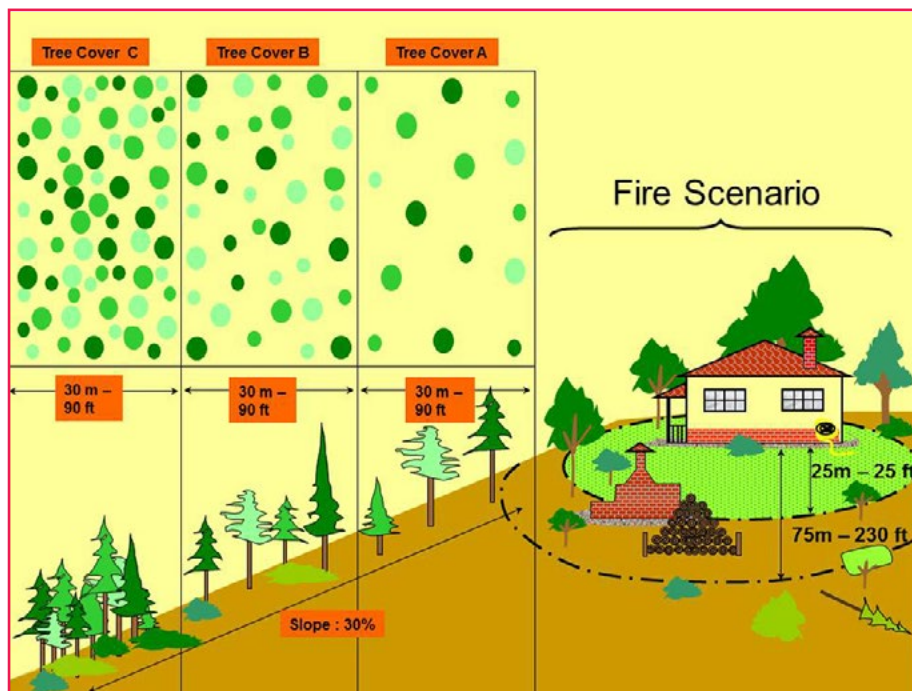

Figure 2—*Firewise planning: model of defensible space around a house. Firewise planning entails fire mitigation measures in and around areas in the wildland–urban interface. Reducing fuel loads in the nearby forest lowers the rates of radiant heat from an approaching fire. Buffer strips within homeowner property limits are necessary due to firebrands blowing across fuelbreaks and starting spot fires near homes.*

Studies have found that those who have experienced wildfire in the past have an increased awareness of

risk. However, past experiences with wildfire do not automatically motivate people to undertake fire management practices (Blanchard and Ryan 2007). According to Sims and Bauman (1983), experiencing wildfire increases risk awareness only for a relatively short period. Therefore, mitigation measures and statutory change are most likely to succeed immediately following an event.

A central question is this: Who owns the risk? Is it really individual homeowners? After all, homeowners pay taxes to public authorities, who give permits to build houses in wildlands. Moreover, the main risk factor does not come from fires starting on a homeowner's property but rather from heat transfer coming from fuel loads in wildlands. And the wildlands typically belong to a State or Federal government, to a municipality, or to other private landowners (fig. 3).
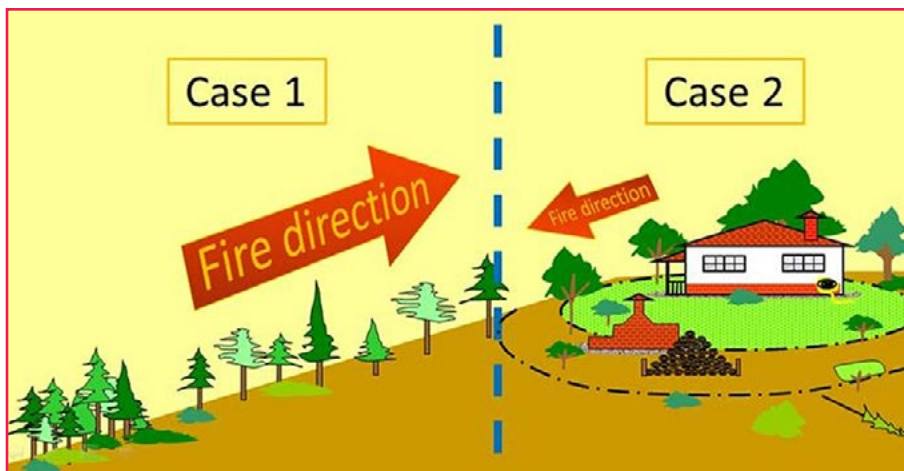

Figure 3—*Risk ownership in a wildland–urban interface area. The blue dashed line indicates the limit of the homeowner's lot. The arrows indicate the level of intensity of a fire originating in a forest (case 1: responsibility of the forest owner) versus the level of intensity of a fire originating on the lot of a private homeowner (case 2: responsibility of the homeowner). From a legal point of view, risk ownership is a controversial question that is difficult to sort out.*

to wildfire risk planning. Reducing uncertainty makes decision making more consistent. Costa and others (2009) described new systematic approaches to determining the most likely fire spread patterns as a function of physical geographic criteria and local synoptic situations. Such approaches create an opportunity to incorporate wildfire risk into land management planning (Plana and others 2015). Likewise, economic arguments can build support for wildfire mitigation

Cross-Sectoral Risk Planning and Societal Involvement

Figure 4 shows the risk cycle, including the interrelationships between its components: The more a community prepares in the context of these interrelationships, the fewer efforts are necessary to protect it from wildfire. All public and private actors should be involved in the causal chain, from territorial to forest and home management scales across multiple sectors (a cross-sectoral approach is where forests, agriculture, livestock, and urban and spatial planning policies meet). Making a political arrangement creates a framework for operational cooperation and coordination among private stakeholders and public agencies.

It is important to reduce uncertainty and give strength and legal status
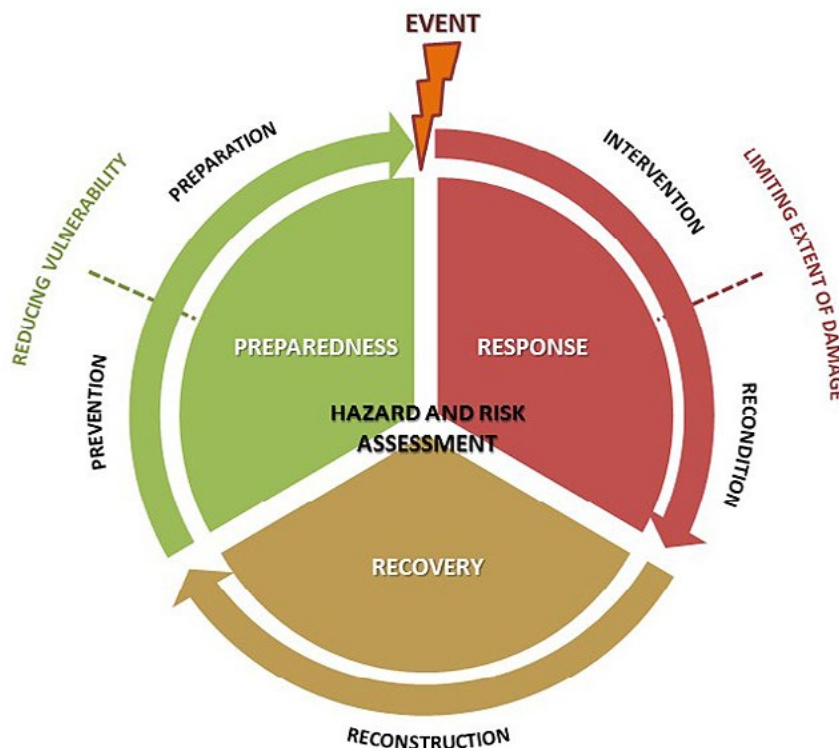

Figure 4—*Components of the risk cycle. Various actors can work together at each stage in the cycle to mitigate risk. Source: Adapted from PLANAT (2011).*

measures as cost-effective. In any case, risk assessment should take into account the physical criteria for fire spread patterns, which are highly influenced by topography, weather, and fuel load distribution. Risk assessment should adapt such criteria to the spatial scope of municipal prevention plans.

Municipalities and other local governments can play a key role in wildfire risk planning as intermediaries between homeowners and planners at higher levels of government. Local planning processes can promote stakeholder awareness and establish responsibilities among homeowners while building trust and

Psychological variables related to public beliefs and attitudes affect public support for wildland fire management strategies.

credibility. A new and enhanced risk culture should emerge for the WUI.

At the community level, even a partial perception of risk can build local capacity for cooperation in prevention and self-protection. Fire education and outreach programs should be designed to change people's attitudes, behavior, and level of knowledge. But program delivery should be effective enough to build local engagement and commitment.

Creating debate about levels of vulnerability and about alternatives for mitigating risk offers citizens a chance to interact with fire agencies in making management decisions. Community participation in decision making promotes democratic development and implementation of management actions. When proposals come from homeowners, social acceptability is higher, as are social commitment and sustainable activism on behalf of firewise management.

Furthermore, the conjunction of local and scientific/management perceptions contributes to a broader understanding of natural/social systems and processes by giving rise to an interactive and two-way learning process among participants (Paveglio and others 2009). Participation programs foster contacts among neighbors, helping to form a sense of community (McDaniel 2014). People come to understand that wildfire hazards affect everyone and that cooperation is required to tackle the common challenge.

To help communication processes succeed, messages should be tailored to different groups and specific social contexts. Some authors have proposed tailoring educational programs to specific groups, such as property owners, year-round residents, chambers of commerce, local realtors, and schools (MacGregor and others 2008; McDaniel 2014).

MacGregor and others (2008) explained that the goal of the message should be not only to make people aware of risk but also to
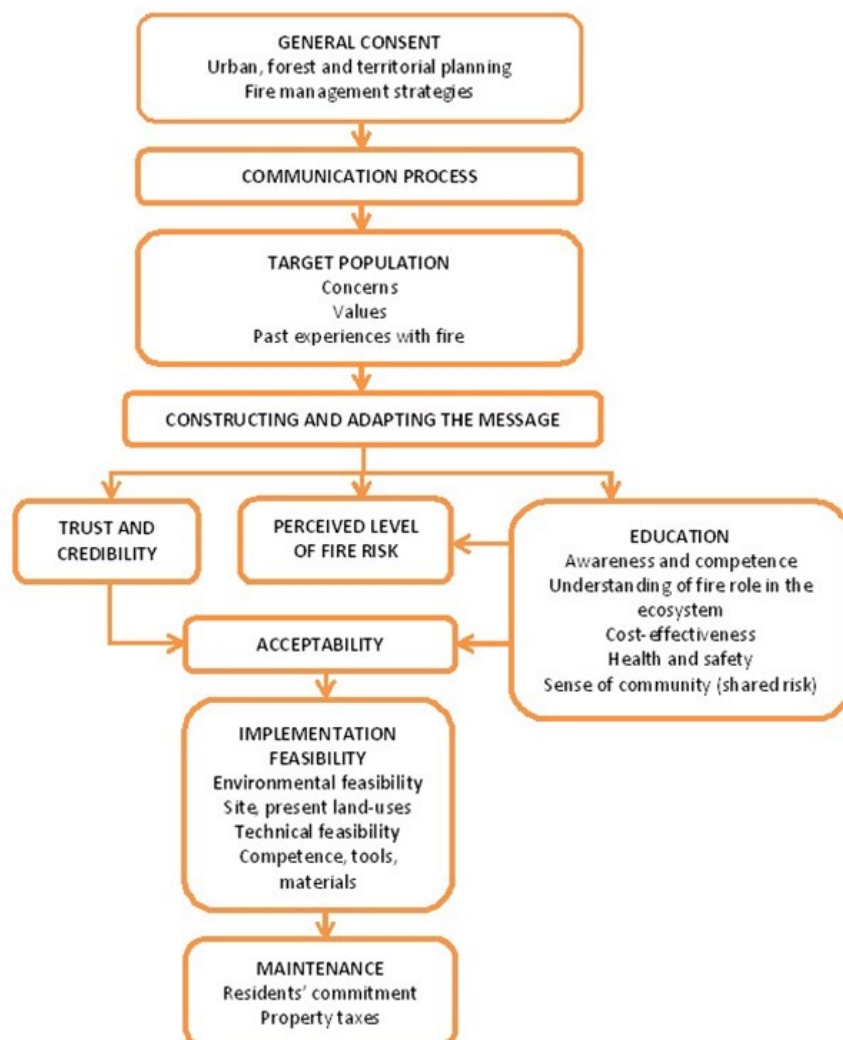

Figure 5—*Sequence of stages in the process of communication and factors that influence public acceptance of wildland fire management. Source: Plana and others (2015).*

get them to understand the severe consequences they could suffer and, most importantly, the effectiveness of their efforts to manage and reduce risk. Furthermore, the aim of communication processes should be to give communities the appropriate capability and tools (such as guidelines offered by fire management authorities) to take effective fire prevention actions.

Pedagogical strategies are also instrumental in the communication process. As a core premise, communication should not cause fear or discomfort within the community. The general misperception of reality (including a reluctance to cut trees and a false sense of safety) teaches the importance of educating while communicating. The goal is to give people a better approach to actual wildfire hazard and risk prevention planning.

A lack of trust and credibility constitutes the main barrier to effective risk communication (Steelman and McCaffrey 2013). According to McDaniel (2014), personal contact through interactive events such as workshops, field trips, and demonstration sites can show openness, giving experts the chance to substantiate and clarify their actions while giving the public the opportunity to ask questions and express concerns. Moreover, the credibility of the information provider and the clarity of the message will influence the acceptability of the message and increase the likelihood that people will practice wildfire mitigation.

Reducing community vulnerability means integrating the social dimension into risk management planning, thereby building trust and credibility while properly assigning risk ownership responsibilities to private and public actors (fig. 5).

Taking Social Factors Into Account

Wildfire risk assessment and wildland fire management analysis, especially in the current global change context, need to include room for interpretations from the social sciences. Such interpretations should include the new forms of interaction between wildland fire and society, particularly the impacts of fire on expanding WUI communities.

The synergistic effect of working in partnership might encourage learning and the exchange of knowledge, which should be robust, homogeneous, harmonic, and transferable. Knowledge exchanges in group settings can systematically improve approaches to wildfire risk planning.

Communication processes should be targeted at the local level to engage homeowners in planning processes. Effective communication is designed to increase local understanding of the need to take responsibility for creating and maintaining defensible spaces around homes. ■

Acknowledgments

References

Absher, J.D.; Vaske, J.J. 2007. Examining the sources of public support for wildland fire policies. Fire Management Today. 67(1): 35–39.

Blanchard, B.; Ryan, R.L. 2007. Managing the wildland–urban interface in the Northeast: perceptions of fire risk and hazard reduction strategies. Northern Journal of Applied Forestry. 24(3): 203–208.

Costa, P.; Castellnou, M.; Larrañaga, A. [and others]. 2011. Prevention of large wildfires using the fire types concept. Barcelona, Spain: Departament d'Interior de la Generalitat de Catalunya. 88 p.

Cutter, S.L. 1996. Vulnerability to environmental hazards. Progress in Human Geography. 20(4): 529–539.

MacGregor, D.G.; Finucane, M.; González-Cabán, A. 2008. The effects of risk perception and adaptation on health and safety interventions. In: Martin, W.E.; Raish, C.; Kent, B., eds. Wildfire risk: human perceptions and management implications. Washington, DC: Resources for the Future: 142–155.

Martin, W.E.; Raish, C.; Kent, B., eds. 2007. Wildfire risk: human perceptions and management implications. Washington, DC: Resources for the Future. 310 p.

McDaniel, J. 2014. Building trust, establishing credibility, and communicating fire issues with the public. Fire Science Digest. Boise, ID: Joint Fire Science Program. 17 (January): 1–11.

Paveglio, T.B.; Jakes, P.J.; Carroll, M.S.; Williams, D.R. 2009. Understanding social complexity within the wildland–urban interface: A new species of human habitation? Environmental Management. 43: 1085–1095.

Plana, E.; Martín, D.; Font, M. [and others]. 2015. Wildfire risk communication and governance: managing societal involvement and multi-stakeholder cross-sectoral planning. In: Plana, E.; Font, M.; Green, T., eds. Operational tools and guidelines for improving efficiency in wildfire risk reduction in EU landscapes. FIREfficient Project. CTFC Editions. Solsona, Spain: Forest Sciences Centre of Catalonia: 19–25.

PLANAT (National Platform for Natural Hazards). 2011. Why do we need integrated risk management? Switzerland. http://www.planat.ch/en/specialists/risk-management/. (August 16, 2017).

Sims, J.H.; Bauman, D.D. 1983. Educational programs and human response to natural hazards. Environment and Behavior. 15(2): 165–189.

Steelman, T.A.; McCaffrey, S. 2013. Best practices in risk and crisis communication: implications for natural hazards management. Natural Hazards. 65(1): 683–705.