Chapter 7
Social-Ecological Transformation to Coexist with Wildfire: Reflecting on 18 Years of Participatory Wildfire Governance

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Abstract The risk of devastating wildfires – exacerbated by climate change – poses a threat to urban areas worldwide. There is a pressing need to strengthen societal efforts to coexist with this perturbation by creating resilient social-ecological systems. To enable this, a significant social-ecological transformation of wildfire-prone regions seems to be required. Here, I reflect on my experience in three projects of participatory wildfire governance conducted in the Barcelona Metropolitan Region (Spain) during the last 18 years. The goal is to learn from the experience and to sketch new transformative options to coexist with wildfire. After a literature review on the links between resilience to wildfire, adaptation and transformation, I analyse these projects with regard to their achievements, challenges and potential new transformative avenues. The analysis shows the crucial role that a locally rooted civil society can have when it is able to network with key agencies and actors over the long term. It also shows the importance of developing integrative wildfire planning networks where different ecosystem services and values are considered in successive phases of public deliberation between actors, citizens and wildfire managers. It is concluded that deepening the transdisciplinary content of participatory wildfire governance can increase its transformative potential.

Keywords Wildfire · Transformative adaptation · Participatory wildfire governance · Resilience

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7.1 Introduction

Wildfires are increasingly a matter of urban concern. I am now watching a picture of the Golden Gate Bridge of San Francisco taken on 9 September 2020. The lights of the bridge flickered amidst a reddish atmosphere that covered the entire city with smoke. The state of California was going through an outstanding wildfire episode that lasted for weeks. In August of that year, the daily wildfire radiative power had massively exceeded the average values of the period 2003–2019 (Fig. 7.1). *Alarming, but unsurprising*, said experts quoted by the press. Indeed, between 1972 and 2018, annual burned area in California has increased fivefold, and summer fire extent up to eightfold, most likely due to increased aridity caused by climate change (Williams et al. 2019). Wildfire episodes affecting hundreds of thousands of hectares and producing casualties and infrastructural damage are thus expected to become more frequent. At the heart of the problem, there is the expansion of the so-called Wildland-Urban Interface (WUI), i.e. residential developments spreading across highly flammable forestland.

In Europe, the risk of increasingly devastating wildfires in the WUI is considered one of the main challenges faced by fire departments (Castellnou et al. 2019). In the last decades, Mediterranean forests of Europe have witnessed an increase in the

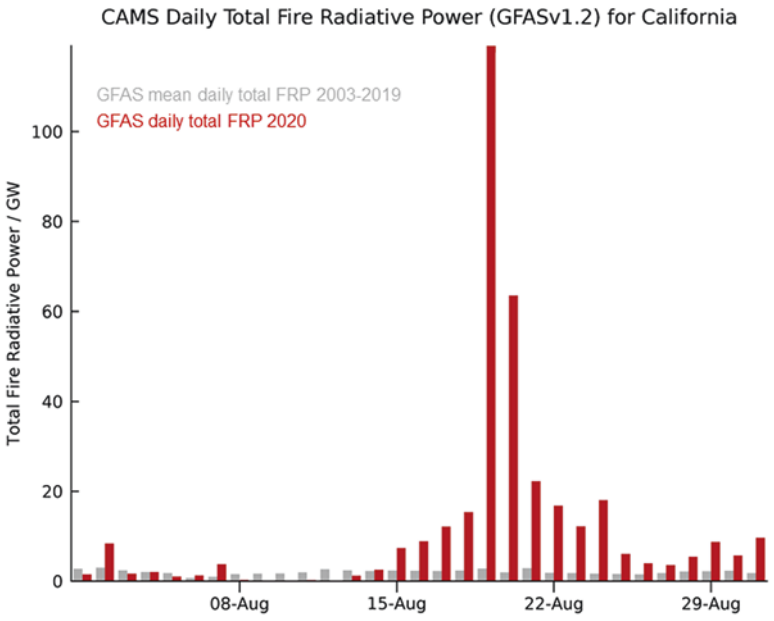

Fig. 7.1 Daily total Fire Radiative Power (FRP) for California throughout August 2020 (red) and the 2003–2019 daily average for the month (grey). The GFAS, meaning Global Fire Assimilation System, assimilates FRP observations from satellite-based sensors to produce daily estimates of emissions from wildfires and biomass burning. (Source: Copernicus Atmosphere Monitoring Service, European Centre for Medium-Range Weather Forecasts (2020))

length of fire weather seasons due to a changing climate (Jolly et al. 2015). Regarding the number of large wildfires (above 500 ha), even if no increasing trend is detected, these events have been catastrophic for entire regions due to human casualties and socioeconomic losses (San-Miguel-Ayanz et al. 2013). Projections for the coming decades suggest a sharp increase in the number of days with meteorological conditions conducive to extreme wildfires (Bowman et al. 2017). Summer burnt area is thus projected to increase between 40% and 100% (Turco et al. 2018; see also Moritz et al. 2012), even if a considerable uncertainty remains in the models used (Brotons and Duane 2019). More northern European latitudes have recently experienced unprecedented wildfire events too, turning the wildfire challenge into a continent-wide matter of concern much beyond the Mediterranean (San-Miguel-Ayanz et al. 2018; Castellnou et al. 2019; see also Müller et al. 2020).

The situation is similar in other regions of the world, where extreme wildfire activity has increased or is expected to increase, including some regions of the UK (Albertson et al. 2010), some regions of Australia (O'Neill and Handmer 2012) and the Western USA (McKenzie et al. 2004; Westerling et al. 2006). Whereas fire activity is expected to increase in some areas of the planet and to decrease in others (Krawchuk et al. 2009; Moritz et al. 2012), globally the length of fire seasons has increased (Jolly et al. 2015), and fire seasons are expected to be more severe (Flannigan et al. 2013). Actually, a new global pattern of extreme wildfire events is observed from 2016, with erratic behaviours and unprecedented speed, intensity and extension (Duane et al. 2021). This is, for example, the case of the 2017 wildfires in Portugal, which reached propagation rates of up to 14,000 ha/h and caused 117 casualties due to complex firestorms that are just starting to be understood by wildfire managers and scientists (Castellnou 2020; San-Miguel-Ayanz et al. 2020; Duane et al. 2021).

Many of the world's fire-prone regions are densely populated and have high social, economic and ecological values at stake (Moritz et al. 2014; Doerr and Santín 2016; Otero et al. 2018). Thus, there is a pressing need to strengthen societal efforts to coexist with wildfire in their urban and metropolitan areas. Coexisting with wildfire is here understood in close connection with both adaptation and resilience. Adaptation can be broadly defined as a social process aimed at minimizing the adverse impacts of expected wildfires via the creation of resilient social-ecological systems – including urbanized environments – able to withstand this perturbation without major losses in social and ecological functions (Prior and Eriksen 2013; González-Hidalgo et al. 2014; Abrams et al. 2015; Fischer and Jasny 2017). The focus of this chapter is on *transformative* adaptation, highlighting that resilience to wildfires requires a radical social-ecological transformation including for instance the political economy of land use, institutional cultures and nature's values (Otero and Nielsen 2017). Participatory governance is a key element of such necessary transformations (Otero et al. 2018). However, the literature has not yet provided studies assessing the transformative effect of participatory governance efforts, especially in the mid-term (decades).

In this chapter I look back to my experience in three projects of participatory wildfire governance conducted in the last 18 years, which I treat as case studies. The

projects are located in the outer ring of the Barcelona Metropolitan Region, in Spain. The goal of this self-reflexive approach (Lang et al. 2012; Popoveniuc 2014; Schneider et al. 2019; Otero et al. 2020a) is to learn from the accumulated experience and to sketch new transformation options to coexist with wildfire. To do so, I (i) reviewed the main publications that emerged from these projects, (ii) drew on my personal memories (thus, the analysis has a subjective component) and (iii) updated on the projects' development through informal conversations and email exchanges with the colleagues involved in them. In all cases, the analysis focused on the transformative potential of the projects, in hindsight. The chapter is structured as follows. Section 7.2 provides a synthesis of the literature on resilience and adaptation to wildfire, with the emerging focus on transformation. Section 7.3 provides the context of the case studies, and Sect. 7.4 describes them in detail. Section 7.5 assesses their transformative potential, and Sect. 7.6 closes with some conclusions. I use *the author* to refer to myself.

7.2 Coexisting with Wildfire Requires a Radical Social-Ecological Transformation

7.2.1 Proposals to Adapt and Build Resilience to Wildfire

There is a growing literature on how to better coexist with wildfire. The focus of this literature is often what kind of social relationships facilitate resilience and adaptation. A review of social science research on wildfire found that social relationships in wildfire-prone areas can increase wildfire preparedness by building a sense of community that facilitates the exchange of crucial information (McCaffrey 2015). Similarly, Prior and Eriksen (2013) showed that community cohesion supports the adoption of protective measures (such as the reduction of combustible materials around houses) that contribute to adaptive capacity and resilience. This is so because people draw on social cohesion to get the support and resources necessary to undertake such measures (Prior and Eriksen 2013). Gender relations also matter. Eriksen (2014), for example, concluded that the ability of all family members to contribute to wildfire preparedness is crucial to support resilience strategies, challenging gendered patterns of vulnerability.

Beyond the community level, the importance of social relationships for adaptive capacity and resilience is also recognized in the literature about the so-called participatory wildfire planning networks. These networks are made of public agencies, actors and citizens, and they are being co-developed in different wildfire-prone countries of the world (Moore et al. 2002; Chapin et al. 2008; Butler and Goldstein 2010; Everett and Fuller 2011; Almstedt and Reed 2013; Plana et al. 2015; Gazzard et al. 2016; Otero et al. 2018, 2020b). Such co-production is driven both by a normative motivation to democratize wildfire management (Morehouse and O'Brien 2008; Otero et al. 2018) and by the recognition that the complexity of the wildfire

problem requires new governance arrangements operating at multiple scales (Butler and Goldstein 2010; Ager et al. 2015; Fischer et al. 2016). Indeed, community wildfire resilience can be enhanced by adaptive governance mediated by institutions at multiple scales, as it opens social opportunities to learn from and adapt to wildfire (Abrams et al. 2015; Otero et al. 2018). Collaboration across scales and agencies, as well as community involvement, are considered key factors for effectively planning wildfire resilience schemes (Plana et al. 2015; Tàbara et al. 2003), not least in urban and metropolitan settings. A crucial inter-agency link highlighted in the literature is that between wildfire risk management and land planning. For example, Moritz et al. (2014) argued that governments and agencies should restrict urban development in the most wildfire-prone locations (see also Plana 2011). Badia et al. (2019) in turn suggested the need to adapt wildfire prevention schemes to the different types of existing residential developments. In urban and metropolitan settings, participatory wildfire planning networks have to integrate a wide diversity of interests at stake while deliberating about alternative planning and policy options. To facilitate this endeavour, different tools have been used with varying degrees of success, like social-ecological models of wildfire risk (Fischer et al. 2016; Spies et al. 2014) or participatory multi-criteria evaluation methods (Otero et al. 2020b; Gamboa et al. under review).

Regardless of the importance of building the right social and institutional relationships, some wildfire practitioners and researchers have long emphasized that a better coexistence with wildfire requires fire restoration. Fire restoration refers to the reintroduction of (wild)fire in ecosystems after decades of suppression policies, which are considered to be one of the underlying causes of increased risk as they enable fuel build-up (Donovan and Brown 2007; Calkin et al. 2015; Otero and Nielsen 2017). Thus, authors stressed the need for incentives that encourage fire managers to consider the beneficial effects of allowing wildfires to burn under certain circumstances rather than suppressing them all as quick as possible (Donovan and Brown 2007; North et al. 2015; Thompson et al. 2015). This requires fundamental organizational changes in how the fire departments think about, plan for and respond to wildfires (Thompson et al. 2018; Castellnou et al. 2019). The traditional suppression rationale of the wildfire management system can also be overcome by developing multiscale participatory planning networks that help overcome institutional barriers to fire restoration (Butler and Goldstein 2010).

Letting some wildfires burn under previously planned conditions could be a cost-effective fuel reduction strategy (Regos et al. 2014; Domènech et al. 2018; Oliveres 2021) even if considerable challenges remain regarding the social acceptance of this measure, especially in densely populated urban areas (Otero and Nielsen 2017). A softer, potentially more easily acceptable fire restoration measure is prescribed burning, consisting in the planned use of fire under specific environmental conditions for fuel load reduction. Studies showed that prescribed burning can reduce wildfire intensity under climate change, especially if combined with other treatments like thinning and when adapted to the spatial pattern of past wildfires (Piñol et al. 2005, 2007; Piqué and Domènech 2018; Duane et al. 2019). Whereas increased wildfire activity due to human influence can threaten species with extinction, fire

restoration has the potential to benefit biodiversity if it is tailored to the requirements of particular ecosystems and species (Kelly and Brotons 2017; Kelly et al. 2020).

Finally, there are a number of other proposals to build wildfire-resilient social-ecological systems that are likely to be complementary with fire restoration attempts (Pais et al. 2020; Campos et al. 2021). These include fuel management through activities like extensive grazing (Otero 2011a; Varela et al. 2018), biomass extraction for energy production (Regos et al. 2016), the creation of new cropland or the recovery of old cropland in current forests (Aquilué et al. 2020) and the integration of wildfire risk into forestry practices (e.g. developing new management practices aimed at achieving enough separation between understory and overstory in order to prevent crown fires, Piqué et al. 2011). All together, these proposals entail a recovery (or remaking) of the old rural mosaic, which can be suitable to reduce climate change-induced increases in wildfire intensity and burnt area (Loepfe et al. 2010, 2012).

7.2.2 The Need for Transformative Approaches in Wildfire Governance

Coexisting with wildfire in a rapidly changing Earth seems to require a number of interlinked social, institutional, cultural and ecological changes: cohesive communities, inter-agency collaboration, citizen involvement, shift from fossil to biomass energy and accepting that our landscape may need to burn if it is to become resilient. Altogether, these changes hint at a profound transformation of the current social-ecological relationships (Howitt 2014). Indeed, O'Neill and Handmer (2012) pointed out the need for transformative adaptation, i.e. an adaptation which is concerned with the root causes of wildfire vulnerability and that calls for deep shifts in people's relationships with their environment.

Transformative adaptation for example includes a substantive cultural change towards accepting that wildfires are intrinsic part of some ecosystems, especially under climate change. To enable such change, the entrenched habit of attributing blame for wildfires to certain people (e.g. a mistake in the fire department's operations) should cease, especially in parliamentary debates (González-Hidalgo et al. 2013, 2014). The latter should instead endorse constructive approaches that promote learning while addressing the root causes of wildfire risk (González-Hidalgo et al. 2014). Such causes include rural exodus and the abandonment of the countryside, forest expansion, urbanization, fossil fuel-based food and energy systems and a culture aspiring to control nature (Otero and Nielsen 2017). To address these causes and build resilience to wildfire, authors stressed the need to create sites of *healthy contestation* that acknowledge the political dimension of the choices that need to be made (Buizer and Kurz 2016). In these sites, the political economy of land use underlying wildfire risk can be opened to debate and antagonism

channelled into transformative avenues (González-Hidalgo et al. 2014; Otero et al. 2018). Similarly, the creation of *political communities* able to deal with conflicting values (e.g. wildfire security vs. scenic beauty in the WUI) while shaping less flammable landscapes was suggested as a way forward in this direction (Moore et al. 2002; Morehouse and O'Brien 2008). In theory, these communities have the potential to redefine agency over landscape, i.e. the power to actively shape it, when co-designing wildfire resilience schemes (Otero et al. 2018).

However, all these changes pertaining to transformative adaptation are not easy to implement. The wildfire-prone regions of the Global North are warming, urbanizing and afforesting at fast rates, and the efforts underway to coexist with wildfire are not able to counteract these underlying trends (Otero and Nielsen 2017). Thus, more research is needed on the transformative processes behind these efforts. In particular, we need more and better knowledge about their obstacles and their catalysers.

7.3 The Barcelona Metropolitan Region (Spain): A Vulnerable Landscape

The three case studies that will be analysed are located in the Barcelona Metropolitan Region (BMR) (Autonomous Community of Catalonia, Spain). The BMR hosts 5.2 million people, which represents two thirds of the Catalan population (IERMB 2021), in a territory that amounts to ca. 10% of the Autonomous Community. The BMR is structured in a compact centre (the municipality of Barcelona), a dense first metropolitan ring (composed of 32 municipalities), an extensive second metropolitan ring (124 municipalities) and 7 urban sub-centres of between 50,000 and more than 200,000 inhabitants (Catalán et al. 2008). Two mountain ranges parallel to the coastline dominate the BMR: the coastal range (with Garraf, Collserola, Serralada de Marina, Serralada Litoral and Montnegre-Corredor mountains) and the pre-coastal range (with Montserrat, Sant Llorenç del Munt-l'Obac, Cingles de Bertí and Montseny mountains). Contrasting topography (elevation ranges from 0 to 1700 m a.s.l.) and climate (with gradients NE–SW from moist to dry and SE–NW from less to more continental) brings about a high environmental variability, which together with a long-term imprint of human activities shaped remarkably heterogeneous landscapes. Coastal and pre-coastal ranges are mostly covered by continuous forest and shrub, whereas lowland areas are dominated by croplands, forest-crop mosaics and urban areas (Marull et al. 2010). The BMR accounts for more than 40 habitats of European significance, including many species of fauna and flora that are either endangered or threatened with extinction (Marull et al. 2007). Most of the natural protected areas of the BMR are located in mountain areas (Otero and Boada 2007).

Looking back to history allows to better understand the current context of the case studies regarding wildfire risk. On the one hand, the unfolding of urbanization

and industrialization, together with globalization trends, led to a diminishing profitability of forestry (Boada and Zahonero 1998; Otero et al. 2008). Low productivity and the mountainous relief made these forests not competitive enough, as it happened in most of the Catalan forests (Rojas 1999). As a result, they were gradually left unmanaged leading to vegetation regrowth and fuel accumulation. On the other hand, cropland abandonment occurred as farmers shifted to non-farm jobs and/or moved to towns (e.g. Otero et al. 2013), triggering afforestation processes that added up potentially burnable fuel. In parallel, urbanization often occurred in forest areas or in areas undergoing afforestation (e.g. Otero et al. 2011), creating a WUI which is highly vulnerable to wildfire. Between 1956 and 2000, 14% of the BMR experienced urbanization, 10% afforestation and 7% farmland abandonment (Başnou et al. 2013). Large wildfires become specially threatening under extreme weather conditions, which are not only relatively common in the Mediterranean climate of the BMR but also increasing with climate change (Brotons et al. 2013; Duane and Brotons 2018; Duane et al. 2021). Under current vegetation and climatic conditions, experts consider that the main mountain ranges of the BMR (Collserola, Garraf, Montnegre-Corredor) have the potential to burn entirely in less than one day (Pahisa 2021).

7.4 Participatory Wildfire Governance: Three Case Studies

The three case studies analysed in this chapter are attempts to build resilience to wildfire by participatory adaptive governance, where the production of scientific knowledge blurs with the co-design and implementation of management actions on the ground by different actors. Table 7.1 provides a detailed description of each case study, including the author's changing role in them. The approach used in the case studies was informed by three main concepts or forms of research and practice, which partly overlap: transdisciplinarity, action research and adaptive governance. Transdisciplinarity can be defined as a research procedure that integrates scientists from different disciplines, non-academic actors and citizens in the co-production of knowledge that is intended to address complex societal and environmental problems (Darbellay et al. 2014; Lang et al. 2012). Even if a direct link between transdisciplinarity and real societal transformations still lacks empirical support (Schäfer et al. 2020), scholars working in this domain implicitly consider that transdisciplinarity has a transformative potential (Otero et al. 2020a). Action research refers to *a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes* (Reason and Bradbury 2008: 4). In this process, insider or outsider scientists work together with local communities to address a particularly problematic situation by trying to initiate desirable social-ecological transformations (Otero 2011b). At the same time, the knowledge produced through action research can be transferred beyond its immediate context so that others can see its application to their contexts (Herr and Anderson 2005), for instance, via peer-reviewed scientific literature. In such transference, this knowledge may be

Table 7.1 Basic description of case studies

Description	Case study #1: Municipality of Matadepera	Case study #2: Region Montseny-Montnegre-Corredor	Case study #3: Montseny Biosphere Reserve
Social-ecological context	Area: 25.4 km^2. Population: 9496 (2020). Elevation range: ca. 400–1100 m.a.s.l. Located on the hillside of the pre-coastal mountain range of Sant Llorenç del Munt-l'Obac, outer ring of the Barcelona Metropolitan Region 61% belongs to the Natural Park Sant Llorenç del Munt-l'Obac Settlement composed of compact town centre and wealthy low-density housing	Area: 606.0 km^2. Elevation range: ca. 0–1700 m.a.s.l. It includes the coast, the coastal mountain range of Montnegre-Corredor, part of the pre-coastal mountain range of Montseny, and a plain lying between the two mountain ranges Both mountain ranges are protected by natural parks, and Montseny is also a UNESCO Biosphere Reserve Located in the Barcelona Metropolitan Region. The plain and the coast host industrial activities, strategic transport infrastructures and touristic towns Settlement structured in towns, low-density housing and scattered farmhouses	Area: 501.7 km^2. Population: 51,573 (2014). Elevational gradient (max. Altitude is 1700 m.a.s.l.) allows the existence of three biogeographic strata (Mediterranean, Euro-Siberian and Alpine). This, together with a long history of human use, is the origin of a rich biodiversity. It includes 18 municipalities covering the pre-coastal mountain range of Montseny and surrounding plains. Besides the Biosphere Reserve, these municipalities are also partly protected by the Montseny Natural Park It has a core area (conservation function), a buffer area (function of making compatible conservation and human activities) and a transition area (development function)
What was done	Drafting and implementation of a participatory and adaptive land management scheme aimed at building resilience to large wildfires	Set-up of a pilot participatory network to democratize the Fire Department's wildfire prevention and suppression planning and build resilience to large wildfires	Improvement of the pilot participatory network and the method of case study #2 project, with the goal of democratizing the Fire Department's wildfire prevention and suppression planning and building resilience to large wildfires (see case study #2)

(continued)

Table 7.1 (continued)

Description	Case study #1: Municipality of Matadepera	Case study #2: Region Montseny-Montnegre-Corredor	Case study #3: Montseny Biosphere Reserve
By whom	Group of Forest Defence (*Agrupació de Defensa Forestal, ADF*), a municipal association composed of representatives of the Town Council, forest owners and volunteers but managed by volunteers In collaboration with the Local Environmental Council, municipal agencies, the Autonomous University of Barcelona, the Natural Park and other actors Funded by the Matadepera Town Council, the Catalan Department of the Environment, the Natural Park and private foundations	Led by a post-doctoral researcher studying wildfires and social-ecological transformations (Humboldt University of Berlin), the head of the Fire Department's expert group on wildfires (*Grup de Recolzament d'Actuacions Forestals, GRAF*) and a social activist working to empower citizens in democratic politics In collaboration with public agencies in charge of wildfire prevention and suppression, natural parks, town councils, associations of forest landowners, Groups of Forest Defence (*Agrupacions de Defensa Forestal, ADF*), museums and citizens Funded by the German Excellence Initiative through Humboldt University of Berlin	Led by a post-doctoral researcher with expertise in multi-criteria evaluation (Autonomous University of Barcelona) and a researcher with expertise in wildfires and social-ecological transformations (University of Lausanne). The project team included the *Pau Costa Foundation* (network of expertise in wildfire management and ecology) and *El Risell* (cooperative dealing with sustainability and social participation). It also counted on the advice from the Fire Department's expert group on wildfires (*Grup de Recolzament d'Actuacions Forestals, GRAF*) Implemented in collaboration with public agencies in charge of wildfire prevention and suppression, natural parks, town councils, an association of forest landowners, Groups of Forest Defence (*Agrupacions de Defensa Forestal, ADF*), museums and other actors Funded by *Fundación Biodiversidad* of the Spanish Ministry for Ecological Transition

How it was done	Delimitation of Strategic Management Areas (SMA; wildfire-friendly landscape structures that, if implemented, facilitate suppression and limit wildfire size). This delimitation was done by the Fire Department's expert group on wildfires (*Grup de Recolzament d'Actuacions Forestals, GRAF*) Design of a land management scheme with interventions to reduce fuel load in SMA: maintenance of cropland, thinning/pruning of forests and extensive grazing (ca. 140 ha) Approval of land management scheme by Town Council Implementation of interventions through formal and informal agreements with: farmers, forest owners, forest workers, shepherds and other actors Monitoring of interventions' results through observation and (short-term) scientific research Attempt to execute prescribed burns Public outreach on wildfire risk and mitigation measures through publications, media, talks, seminars, social networks etc. Accompanied by the maintenance of forest tracks and water infrastructures and by patrolling shifts during high-risk season (integrated in municipal and regional wildfire prevention schemes) Accompanied by actions to activate the social memory of the rural past (notably through historical research and outreach) and to protect local landscape and rural heritage from urbanization	Identification of expected wildfires, delimitation of wildfire containment polygons (areas used to assess wildfire potential spread) and delimitation of Strategic Management Areas (SMA; wildfire-friendly landscape structures that, if implemented, would facilitate suppression and limit wildfire size) Mapping alternative land management projects Involving regional actors (wildfire governance and others like museums) and co-designing a method to value the landscape of the wildfire containment polygons. The method consisted in gathering actors' input per categories of values (biodiversity, socioeconomic activities etc.) Applying the valuation method in four selected municipalities of the Montseny mountain range Organizing exhibitions in these municipalities in collaboration with municipal councils and *ADF*. The polygons' values were shown in posters, and citizens were invited to rank the polygons Planning a wildfire prevention and suppression strategy based on the priorities expressed in the exhibitions. Such strategy consisted in implementing those SMA protecting the most valued polygons Discussing and approving the strategy with the actors and citizens that participated	Characterization of the wildfire regime: study of wildfire types that affected the region, selection of a reference type (convection wildfire with wind), assessment of expected trends due to climate change and delimitation of wildfire containment polygons (areas used to assess wildfire potential spread) Participatory mapping of landscape values: data collection, definition of value categories and development of raster maps assigning a score to each pixel according to the values contained Participatory prioritization of wildfire containment polygons: selection and application of a multi-criteria evaluation method to rank polygons according to the quantity and diversity of values contained Planning a wildfire prevention and suppression strategy to protect the priority polygons. Such strategy consisted in delimiting and implementing Strategic Management Areas (SMA; wildfire-friendly landscape structures that, if implemented, would facilitate suppression and limit wildfire size) protecting the most valued polygons Discussing the strategy with the actors that participated

(continued)

Table 7.1 (continued)

Description	Case study #1: Municipality of Matadepera	Case study #2: Region Montseny-Montnegre-Corredor	Case study #3: Montseny Biosphere Reserve
Period	2003 to present	2014–2018	2018–2021
Author's involvement	2003–2013: co-leader as president of the Local Environmental Council (2003–2008) and president of *ADF* (2008–2013). Insider (living in the area) 2013–2021: follow-up of activities through communication with colleagues from *ADF*	2014–2016: leader as post-doctoral researcher of Humboldt University of Berlin. Partly insider (living in the area during fieldwork) and partly outsider (living in Berlin) 2017–2018: maintaining contact with the network for dissemination purposes, publication of results and preparation of extended phase (see case study #3)	2018–2019: co-leader as principal investigator of research project (working in the University of Lausanne). Outsider (living in Switzerland) 2019–2021: follow-up of activities through communication with the other co-leader

Source: (#1) Farriol et al. (2007), Otero (2010: 153–156), Otero (2011a). (#2) Otero et al. (2018). (#3) Otero et al. (2020a, b), Gamboa et al. (under review)

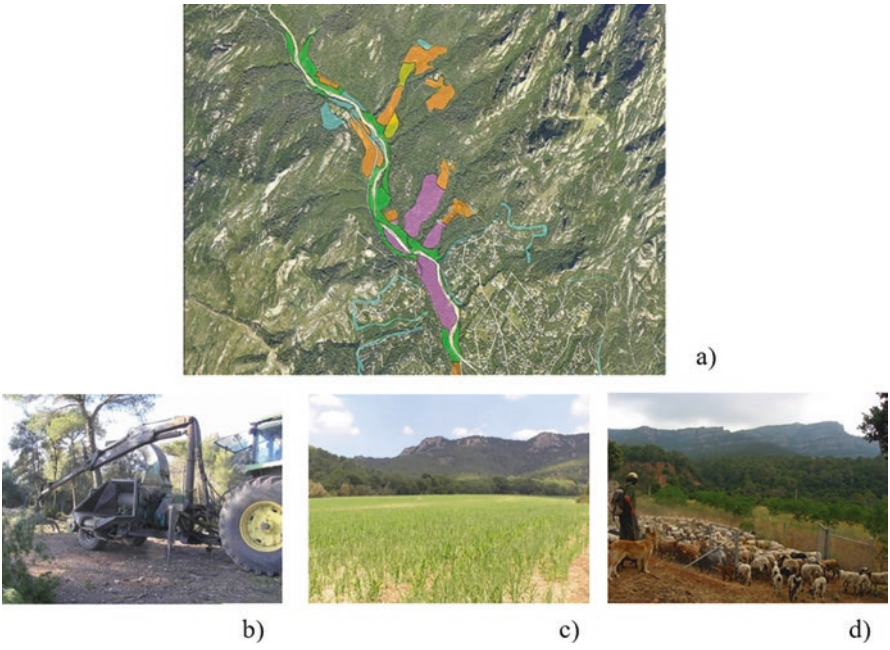

Fig. 7.2 Case study #1: Land management scheme to build resilience to wildfires by Matadepera's Group of Forest Defence (*Agrupació de Defensa Forestal, ADF*). (**a**) Different actions were planned to reduce fuel load in Strategic Management Areas (SMA). Example of the SMA along the main water stream. Orange: active cropland to be maintained. Yellow: abandoned cropland to be recovered. Pink: forest in flat terrain, to be thinned. Green: forest in steep terrain, to be thinned. Blue: low fuel strips around residential areas. (**b**) Forest thinning, consisting in felling a selection of trees and eventually cutting the understorey. (**c**) Cropland maintained by a family of farmers living in one of the farmhouses of Sant Llorenç del Munt, integrated within *ADF*'s management scheme. (**d**) First flock (sheep and goats) that came to Matadepera hired by *ADF*, with Sant Llorenç del Munt in the back. (Source: *ADF* Matadepera (**a**, **b**, **d**); I. Otero (**c**))

strengthened and then fed back to the context from which it emerged (Otero 2010). Finally, adaptive governance is a form of ecosystem management that connects individuals, organizations, agencies and institutions at multiple scales and organizational levels in order to build social-ecological resilience (Cash et al. 2006; Olsson et al. 2007). For these multi-level structures, a crucial challenge is to learn how to be prepared for disturbance and change. Actually, it is considered that social-ecological systems may use disturbances as opportunities to transform themselves into more desirable and resilient states (Folke et al. 2005).

Case study #1 is located in the municipality of Matadepera (9496 inhabitants), on the hillside of the mountain range of Sant Llorenç del Munt-l'Obac, which is protected by a natural park. Matadepera is a wealthy residential suburb located in the second ring of the BMR, neighbouring the cities of Terrassa and Sabadell, two metropolitan sub-centres of more than 200,000 inhabitants each. It has an extensive low-density WUI spanning between the historic centre and the natural park. Out of

the three case studies analysed, it is by far the one that has been ongoing for the longest period. After a large wildfire burned 4600 ha in some neighbouring municipalities in 2003, the volunteer-led Group of Forest Defence (*Agrupació de Defensa Forestal, ADF*) of Matadepera started drafting a land management scheme aimed at building resilience to large wildfires (ADF Matadepera 2005). Back then, the author was living in the municipality and became one of the leaders of this initiative, notably as president of *ADF*. Essentially, the scheme consists in fuel reduction treatments in Strategic Management Areas (SMA) through forest thinning, cropland maintenance or extensive grazing (Fig. 7.2). SMA are areas where wildfires have the potential to decrease in intensity if a fuel reduction treatment has been implemented in advance and therefore help limit wildfire size and impacts. In Matadepera several SMA were planned along the main water stream. These SMA would allow fire brigades to contain a convective wildfire driven by west winds before reaching Sant Llorenç del Munt main summit (La Mola). These SMA were previously identified by the wildfire specialist group of the Catalan Fire Department (*Grup de Recolzament d'Actuacions Forestals, GRAF*) in collaboration with a forest engineer belonging to *ADF*, who drafted the scheme. The scheme was approved by the Town Council in 2005, and the first big interventions were implemented in 2007. The process is still active as of 2021.

Implementing these fuel reduction treatments required reaching written and informal agreements between varied institutions and actors. For example, thinning occurring within the borders of the natural park required the authorization of its management office. As most of the thinning occurred in private forests, the authorization of the forest owners was also necessary. A written agreement signed between *ADF* and the municipality's largest forest owner enabled the use of her farmyard to shelter flocks of sheep and/or goats that were meant to graze in the thinned forests to prevent shrub encroachment (Fig. 7.2d). Yearly written agreements and contracts between *ADF*, the Town Council and the shepherds regulated the financial and logistic support offered to the latter for grazing in these forests. Agricultural works like ploughing and sowing (notably to produce fodder for the flock) were entrusted to farmers. All these agreements required a sustained effort by *ADF* of networking, trust building and mediation between actors whose varied interests had to be made compatible for a common goal (see details of forestry interventions in Farriol et al. 2007; details of other interventions and social agreements in Otero 2011a; see also Otero 2010: 153–156).

The development of this land management scheme was accompanied by the maintenance of strategic forest tracks and water infrastructures (to facilitate the work of fire engines) as well as by patrolling shifts by *ADF*'s team of volunteers in pick-ups equipped with water. These activities were part of official municipal and regional wildfire prevention schemes and were coordinated with the Catalan Fire Department which is the ultimate responsible for wildfire suppression. *ADF*'s land management scheme was also accompanied by outreach activities to raise public awareness on wildfire risk and prevention measures, notably in collaboration with the association Local Environmental Council. All these efforts were likewise integrated with a research project aimed at activating the social memory of the

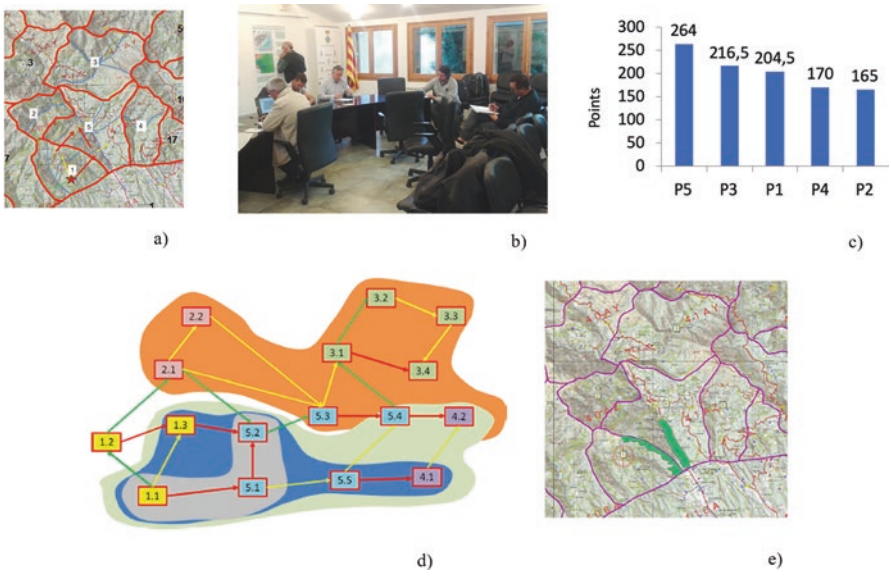

Fig. 7.3 Case study #2: Participatory wildfire planning network in the region Montseny-Montnegre-Corredor. (**a**) The pilot area was divided in wildfire containment polygons (red line) and sub-polygons (blue line). A convective wildfire was simulated starting in polygon 1 (red star) and driven by west winds. Red arrow: front spread (high intensity); yellow arrow: flank spread (medium intensity); green arrow: back spread (low intensity). (**b**) Public exhibition in Montseny municipality (4 May 2016) co-organized by the local government. After reading posters about the participatory process and the values of each polygon, participants were asked to fill a form where they could rank the polygons and add additional values. The posters were previously co-designed with regional actors. (**c**) Aggregate polygon ranking, considering the two exhibitions conducted. Overall, 68 persons voted. (**d**) Potential area burnt according to different intervention scenarios. Grey, blue and green areas correspond to a wildfire starting in sub-polygon 1.1 (discussed with the actors). (**e**) Strategic Management Areas (SMA) necessary to protect the most valued polygons. The SMA in polygon 5 would allow to contain the wildfire in the valley bottom. If this would work, the burnt area would resemble the grey shape in (**d**). If this SMA is not developed, the burnt area would resemble the blue or green shapes in (**d**). The SMA between polygons 1 and 5 would help by reducing wildfire spotting distance (see details in Otero et al. 2018). (Source: Otero et al. 2018 (**a**, **c**, **d**, **e**); I. Otero (**b**))

municipality's rural past, conducted with the Municipal Archives (Aguilar 2012; Ruiz et al. 2008). Such a research project was part of the PhD thesis of the author (Otero et al. 2011) at the Institute of Environmental Science and Technology of the Autonomous University of Barcelona (ICTA-UAB).

Case study #2 is located in the north-east of the BMR, in a region spanning from the southern slopes of the pre-coastal Montseny mountain range to the coastal range of Montnegre-Corredor, including municipalities of the counties of Vallès Oriental and Maresme (Table 7.1). This region is a hotspot of industrial activities, strategic transport infrastructures and urban and suburban areas, including touristic towns by the seaside. The author moved to this region by the end of 2012. In 2014 he started a postdoc on the political ecology of wildfires in Humboldt University of Berlin,

which allowed him to set up and monitor a participatory network to build resilience to wildfires in the mentioned region. For this, he built on the experience he had acquired in Matadepera but also integrated the expertise of two key persons: the head of *GRAF* and a social activist from Barcelona. The former aimed at democratizing the practices of the Fire Department by incorporating social values of landscape into wildfire management. The latter aimed at empowering citizens in democratic urban and land-planning politics. It was the aftermath of Spain's acute economic and democratic crisis, when citizens mobilized in new practices of *real democracy* and in defence of public services (Asara and Muraca 2015).

The method shared the philosophy of case study #1 developed in Matadepera: wildfire intensity and impacts can be reduced if appropriate fuel reduction treatments are implemented in SMA. Yet, a number of novelties increased its participatory potential and its complexity. First, *GRAF* delimited not only SMA but also wildfire containment polygons (Fig. 7.3a). Within a polygon, wildfire is expected to burn with a similar behaviour, and all together polygons help assess the wildfire potential size according to different meteorological and intervention scenarios (Fig. 7.3d; Castellnou et al. 2019). SMA and polygons were drawn with the specific scenario of a convective wildfire driven by west winds in mind. Second, a method was co-designed with regional actors (including wildfire and forest management agencies, associations of forest owners and natural parks) to rank these polygons by citizens according to a diversity of landscape values (Fig. 7.3b). Third, the selection of which SMA would be implemented was done according to the ranking stemming from the participatory process (Fig. 7.3c). SMA protecting the most valued polygons were thus prioritized (Fig. 7.3e). And finally, the method included deliberation sessions whereby the Fire Department could negotiate its wildfire management strategy with those actors and citizens having a stake in it. For example, in the last public session of the project, the two prioritized SMA were agreed upon as part of a strategy to limit wildfire spread in the most valued polygon (Fig. 7.3d, e). Due to time and resource constraints, this participatory process was only implemented in a pilot area within the region, consisting of four municipalities in Montseny mountain range (see details of the process in Otero et al. 2018).

The resulting participatory network was mostly active between 2014 and 2016. During this period, the author was partly living in the region (to conduct participatory activities and fieldwork) and partly in Berlin. In 2017 and 2018, the activities of the network were limited to dissemination purposes and to the preparation of a project for an extended phase. In 2018 the author moved to Switzerland and started working in the University of Lausanne.

The extended phase of case study #2 is case study #3, which was funded by the call for climate change adaptation projects of the *Fundación Biodiversidad* (Spanish Ministry for Ecological Transition) and hosted by ICTA-UAB. It focused on the Montseny Biosphere Reserve, in the north-eastern fringe of the BMR. Out of the Reserve's 18 municipalities, 11 are located in the BMR (county of Vallès Oriental), and 7 are located outside (counties of Selva and Osona). It has a population of 51,573 people and is partly protected by the Montseny Natural Park (Table 7.1). This project aimed at improving the pilot method developed in case study #2. For

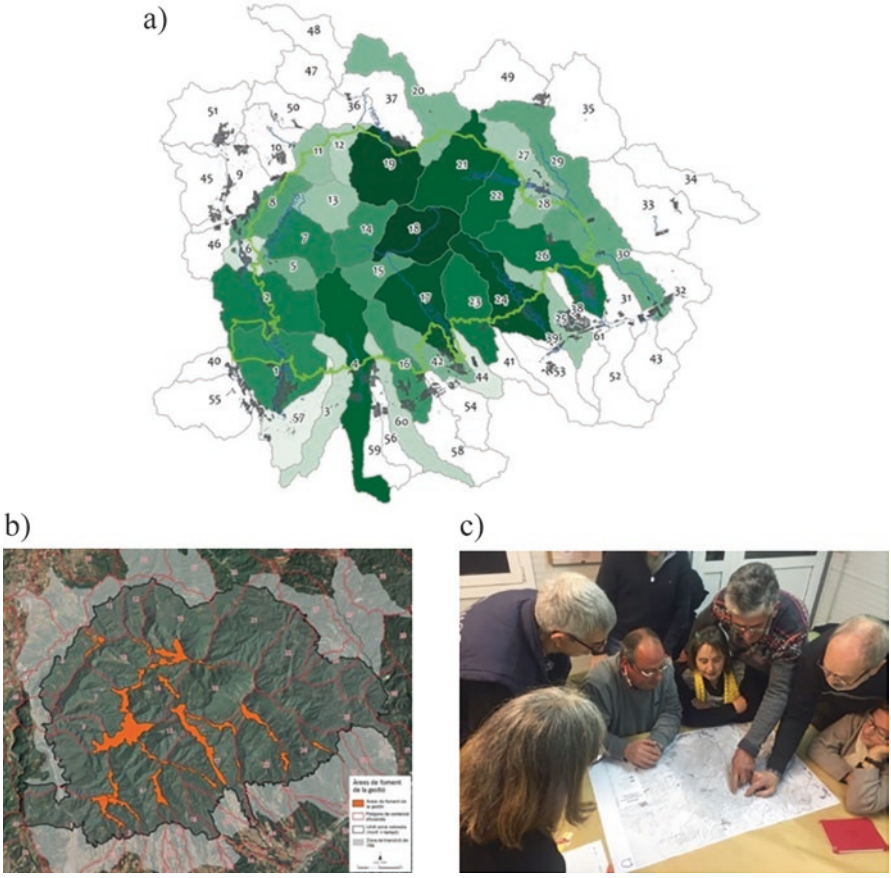

Fig. 7.4 Case study #3: participatory wildfire planning network in Montseny Biosphere Reserve (MBR). (**a**) Multi-criteria prioritization of wildfire containment polygons considering all value categories (biodiversity, socioeconomic activities, heritage, leisure, other values and vulnerability to climate change). Darker green indicates higher priority. The bright green line indicates the perimeter of the valued region (corresponding to the core and buffer areas of MBR). (**b**) Strategic Management Areas (orange) to reduce the impacts of a west wind-driven convective wildfire in the most valued polygons. Red lines: polygons. Dark grey: valued region (core and buffer areas of MBR). Light grey: non-valued region (transition area of MBR). (**c**) Meeting with local actors in Arbúcies (6 February 2019). Two meetings like this one were held with Groups of Forest Defence (*Agrupacions de Defensa Forestal*, *ADF*), firefighters and landowners as well as economic actors related to agriculture and tourism, in order to identify high-value areas for the category *Other values*. (Source: (Otero et al. 2020b (**a**, **b**)); *Espurna* project (**c**))

this, the author hired a post-doctoral researcher at ICTA-UAB and supervised the project from Switzerland. Project partners included the *Pau Costa Foundation*, a spin-off of *GRAF* aimed at disseminating expert knowledge on fire ecology and management, and *El Risell*, a cooperative dealing with participatory processes in urban and land management.

As in case study #2, case study #3 included a wide diversity of actors such as public agencies in charge of wildfire prevention and suppression, natural parks, town councils, an association of forest landowners, *ADF*, museums etc. (Fig. 7.4c). Regarding the input of wildfire experts, it used the same approach as in case study #2 (delimitation of wildfire containment polygons and SMA specific to convective wildfires driven by west winds), but it also included a detailed analysis of the wildfire types that affected the region in the past, as well as a qualitative assessment of the expected trends with climate change. Regarding the participatory landscape valuation, the main difference with case study #2 was the creation of raster maps that assigned a score to each pixel per different value categories. A multi-criteria evaluation method was then used to rank polygons according to the quantity and diversity of values contained (Fig. 7.4a). As in case study #2, the wildfire experts of the team planned a wildfire prevention and suppression strategy intended to protect the priority polygons, this time at the scale of the whole Montseny Biosphere Reserve (Fig. 7.4b; see details of the process in Otero et al. 2020b; Gamboa et al. under review). This network implemented most of its activities between September 2018 and June 2019, coinciding with the funding period. Afterwards, activities focused on disseminating the project results as well as on trying to integrate them into the wildfire prevention planning of the Montseny Natural Park. The latter hired the post-doctoral researcher co-leading the network to work on a diagnosis of its livestock sector, which is considered key for both wildfire prevention and biodiversity conservation. However, the SMA planned in both case studies #2 and #3 have not yet been implemented.

7.5 How to Enhance the Transformative Capacity of Participatory Wildfire Governance?

This section explores how can we enhance the transformative capacity of participatory wildfire governance. It does so by analysing each case study with regard to (a) its achievements, (b) the challenges faced and how they were dealt with and (c) possible new transformative avenues emerging from the experiences.

In Matadepera (case study #1), a bottom-up land management scheme to build resilience to wildfires has been ongoing for 18 years. The scheme has been designed and implemented by a local association led by volunteers which de facto assumes the competence of wildfire prevention that by law belongs to the Town Council. This suggests that a locally rooted and empowered civil society can have a key role in the development of official long-term resilience policies, especially when a large disturbance (2003 wildfire) triggers social organization and learning to adapt (Otero 2010; Folke et al. 2005). This supports the findings from other studies on the importance of people-place connections and community cohesion for resilience (Prior and Eriksen 2013; Berkes and Ross 2013; McCaffrey 2015). Of course, a community is hardly fully cohesive. Matadepera is a wealthy residential area of the BMR, with

luxury houses spreading in the hillside of Sant Llorenç del Munt-l'Obac mountain range. Yet there are large differences within the local population, notably between the old town centre and the residential developments of the WUI. By building resilience to wildfires on a voluntary basis, the local Group of Forest Defence (*ADF*) helps maintain the economic value of the elite WUI which lies at the heart of the municipality's vulnerability. Thus, the author asked himself in several occasions: *Who are we [ADF] working for?* But he concluded that working for the protection of the local landscape and people is a worthwhile endeavour per se, regardless of questions of environmental justice.

In addition, continuous outreach on the management scheme and the activation of the rural memory of the town through research and dissemination (Aguilar 2012) allowed to spread the understanding among the local population that a high wildfire risk stems from the urbanization of the countryside (and related afforestation) and that it requires a holistic land management rather than only suppression means. Among those in *ADF* leading the scheme, such reframing was accompanied by a philosophy consisting in *not to exclude wildfire from the local ecosystem, but rather to build a social-ecological system able to absorb fire events and retain essential structures, processes, and feedbacks* (Otero 2011a: 3). Thus, case study #1 illustrates how the resilience approach to wildfires and fire restoration can be implemented in a territory. In particular, it allows understanding that such implementation is not automatic but requires a negotiation with a diversity of actors who can facilitate or oppose the new approach. In the first years of the scheme's implementation in Matadepera, the natural park reluctantly authorized the forestry works because it feared being criticized for excessive forest clearance by the park's visitors and the inhabitants of the WUI. The absence of strong criticism and the healthy development of the thinned forests in the following years made the natural park more supportive of these interventions. However, some citizens still consider that those works had unacceptable impacts on pine woodlands. In 2013, *ADF* and the wildfire specialist group of the Catalan Fire Department (*GRAF*) planned a prescribed burning within the borders of the natural park, but the latter did not give a favourable report arguing that the park's management scheme did not allow for this particular use of fire and that the smoke would trouble the inhabitants of the WUI. Thus, the burning had to be aborted. As of 2021, *ADF* and *GRAF* are planning another burning outside the borders of the natural park in order to showcase the benefits of this wildfire prevention practice without depending on the natural park's favourable report. These interactions with actors reveal the need to better consider trade-offs between different ecosystem services and values when planning wildfire resilience measures, as well as to integrate antagonist actors earlier on (Otero et al. 2018; Depietri and Orenstein 2020). The methods of case studies #2 and #3 were precisely developed to integrate a broader set of ecosystem services and values, from biodiversity conservation to social recreation, as will be discussed later.

Another significant challenge found in Matadepera was related to the management of the flock. Public money was invested to support the shepherd so that he could graze in the thinned forests and help control shrub growth. Yet the shepherd prioritized other grazing areas that suited better the flock's nutritional needs. In

addition, animals escaped relatively often, creating conflicts with the forest owners and the inhabitants of the WUI. *ADF* thus faced pressure from public authorities and citizens and had to invest considerable efforts to appease tensions while justifying the choice of extensive grazing for wildfire resilience. After several consecutive agreements with different shepherds that did not work, around 2013 an agreement was signed with a shepherd which finally allowed to balance the flock's needs with those related to wildfire management. Currently, this shepherd still grazes his flock in Matadepera and sells the meat in the region. This experience illustrates that the recovery of the traditional rural mosaic in order to better coexist with wildfire (Loepfe et al. 2010, 2012; Aquilué et al. 2020) is not an automatic endeavour. Rather, in highly suburbanized contexts like Matadepera, such a recovery is likely to require a long trial-and-error process to weave new institutional, social and social-ecological relationships.

Knowing whether the management scheme implemented by *ADF* actually contributed to resilience was another major challenge. *ADF* only managed to implement a 2-year monitoring scheme on the grazing effects in the understorey, indicating an incipient change of species composition and a certain (low) control on plant growth (Bartolomé 2009). However, the absence of a long-term monitoring programme on the overall effects of the scheme on wildfire potential intensity and severity made it impossible to made positivist claims on its effectiveness. It is however likely that the current vulnerability is lower than a hypothetical no-intervention scenario, especially considering recent climate warming. This points at the need to further develop methods and languages to assess the (transformative) effects of participatory wildfire governance, a need that has been also identified for transdisciplinary research programmes (Schäfer et al. 2020; Otero et al. 2020a).

The planning network implemented in case study #2 was a significant step forward regarding case study #1 for at least two reasons. First, a broad set of values from actors and citizens (biodiversity, cultural heritage, socioeconomic activities etc.) was integrated in the design of measures to build resilience, potentially appeasing trade-offs between ecosystem services and values perceived by different actors (Depietri and Orenstein 2020). And second, the interaction between citizens, actors and the Fire Department was planned in such a way that the latter could use the results in their suppression activities. This means, for example, that if there is a wildfire in the area, *GRAF* could focus its efforts in protecting the most valued containment polygons (Otero et al. 2018). Wildfire containment polygons are territorial units used by the Fire Department to assess wildfire potential size and impacts, within which wildfire is expected to burn with a similar behaviour (Castellnou et al. 2019; Fig 7.3a). The integration of the social values and interests at stake into operational wildfire strategies is an emerging need among Fire Departments as they find it increasingly difficult to make decisions about intervention priorities, especially under extreme conditions (Castellnou 2017). In this sense, the prioritization of wildfire containment polygons based on an aggregate score (as done in case study #2) is a simple way to translate complex values into wildfire management that can complement existing planning approaches (Everett 2002; Tàbara et al. 2003; Morehouse et al. 2010).

These achievements were enabled by the co-design principle, based on reaching agreements with actors on what was to be done and how during the entire process. This implied that actors were allowed to shape the process according to their own interests, legitimizing it along the way (Otero et al. 2018). Remarkably, a general consensus on priority polygons was found among heterogeneous sets of actors and citizens, suggesting that the conflicting nature of wildfire policies reported by some studies (Carroll et al. 2005, 2006; González-Hidalgo et al. 2014) might be appeased by means of integrative planning networks. In addition, citizens reported to have acquired some knowledge on wildfire and wildfire management after participating in the exhibitions. This suggests that the method developed in case study #2 could be a way to recover local fire knowledge in metropolitan contexts, a crucial component of resilience that nevertheless vanished with urbanization (Huffman 2013). Legitimacy and learning seem to be two crucial processes that helped opening up *GRAF*'s expert knowledge (and its potential effects on landscape) to social deliberation, and they should be properly considered in new transformative wildfire governance efforts.

However, challenges were also huge. It was not possible to integrate all actors and values involved in or potentially affected by wildfire. This was due to not only the project's limited resources but also the extreme magnitude of the expected wildfires, which could for instance block the highway that crosses the region, causing significant socioeconomic impacts elsewhere. Moreover, in the network's final session with actors, *GRAF* did not commit to fully protect the most valued polygon, arguing that the wildfire intensity would be beyond their workable threshold in half of it (Fig. 7.3a, red arrows). In other words, it is not only the local community and the regional actors that have a voice in shaping the landscape of the future but also wildfire itself. In that session though, this insight did not raise opposition by participants, suggesting that some actors in metropolitan settings may be ready to accept letting some wildfires burn. Actually, the method developed in case study #2 could be used to operationalize fire restoration calls (Donovan and Brown 2007; Regos et al. 2014; North et al. 2015; Thompson et al. 2015; Domènech et al. 2018; Oliveres 2021) by agreeing upon which wildfires will be left to burn, under what circumstances and according to whose values between the Fire Department and the affected communities. Other actors that could not be successfully integrated in case study #2 include a network of alternative land management projects in the region. Such network was started by the author and his commune's housemates in order to enhance the transformative potential of case study #2. These projects were considered to have the potential to shape a less flammable landscape and to reframe the wildfire issue as a political problem requiring a transformation of the current land-use model, characterized by persisting land abandonment and urbanization. Projects included for instance producers of artisan goat cheese, organic meat (sheep/goat) and firewood. This network was expected to converge with the landscape co-valuation, but it was aborted due to resource constraints. This suggests that the integration of actors should be better designed in advance and the necessary resources allocated accordingly.

The method developed in case study #3 was a refined version of case #2. Whereas polygons in #2 were ranked based on value scores that were not spatially explicit, in #3 the valuation was done with a GIS (raster) where each pixel had a value score. These value maps can be overlapped with different wildfire containment polygon maps, i.e. designed for different wildfire types and climate change scenarios (Otero et al. 2020b). In turn, the participatory multi-criteria evaluation of polygons can be updated in successive phases of public deliberation, either by adding value categories or by adjusting their weights (Gamboa et al. under review). This can help adapt wildfire management to both changing risk and social priorities, complementing other planning approaches that integrate the biophysical and social dimensions of risk (Ager et al. 2015; Fischer et al. 2016).

Case study #3 achieved a considerable social participation in terms of diversity of public and private actors (Otero et al. 2020b). But municipal elections occurred in May 2019. This complicated the involvement of the mayors in the organization of exhibitions for the participation of local communities, something that instead worked very well in case study #2 (Fig. 7.3b, c; Otero et al. 2018). In both cases though, the selected SMA could not be integrated in the wildfire planning schemes of the municipalities and the natural park, and they have not (yet) been implemented. The reason for this is probably that the network started by the author did not take sufficient root in the region, where unlike case study #1, he was an outsider scientist living elsewhere. This highlights how precious endogenous social initiatives (like case study #1) are for community resilience to wildfires. These initiatives connect expert and motivated volunteers with decision-makers (e.g. the Town Council) which can integrate the measures developed by the former into official land management schemes endowed with sufficient financial resources. The experience in #2 and #3 shows that new transformative wildfire planning projects should plan an executive phase to fund the implementation of those SMA selected in the valuation phase. This could be done in collaboration with local governments and the natural park, something that would require a better transdisciplinary co-design of the project (Lang et al. 2012; Moser 2016). Moreover, the discussions with actors in case study #3 highlighted that one of the main obstacles for the implementation of SMA was the low profitability of the primary sector (agriculture, ranching and forestry). This needs to be addressed when co-designing new transformative projects, for example, by including payments for ecosystem services or subsidies for farmers, shepherds and forest owners that provide fire-regulating services via the implementation of SMA (Varela et al. 2018; Depietri and Orenstein 2019).

Finally, case study #3 revealed one crucial challenge for transformative wildfire governance. Towards the end of the project, the team realized that information on social values and priority polygons was not enough for the Fire Department to decide how to manage a wildfire. In extreme wildfires that are beyond suppression capacity, protecting one polygon amounts to losing others. Even if the GIS would allow to calculate the values gained and lost under different management decisions, future projects should also ask participants what would they be willing to lose in order to protect their most valued areas (Otero et al. 2020b). This seems especially relevant if the proposal to use wildfires as a fuel management strategy (Regos et al.

2014; Domènech et al. 2018; Oliveres 2021) is to achieve social acceptance, and it will need to be tested in a new phase of action research.

7.6 Conclusions

A new type of extreme wildfires, with unprecedented intensity and speed, is being observed globally. Chile 2017, Portugal 2017, Sweden 2018 and Australia 2020 are just some examples of the magnitude of these events which produce casualties and have high socioeconomic and ecological impacts. These new events come to exacerbate the vulnerability of many wildfire-prone regions, especially those with extensive cities and metropolitan areas in the WUI. Fire departments, civil protection agencies and researchers are therefore increasingly concerned. Some of them have long stressed the limits of wildfire suppression, arguing that this policy enables fuel build-up and increases wildfire intensity. They have instead pointed at the need to adapt to this perturbation by creating resilient social-ecological systems that are able to coexist with wildfire. Seen from a holistic point of view, the changes suggested by the literature to coexist with wildfire hint at a profound transformation of the current social-ecological configurations.

This chapter reflects on 18 years of participatory wildfire governance in the BMR (Spain) with a transformative lens. The analysis of three projects where the author was involved during these years shed light on how the changes suggested by the literature play out in a concrete geographical setting, as well as some of the challenges ahead. In particular, the chapter shows the crucial role that a locally rooted civil society can have when it is able to network with key agencies and actors over the long term. Indeed, a long-term commitment well beyond electoral cycles is necessary to weave new social, institutional and social-ecological relationships conducive to resilient systems. The analysis also shows the importance of developing integrative planning networks where different ecosystem services and values are considered in successive phases of public deliberation. This can enable a dialogue between the fire departments, agencies, local governments and communities that facilitates wildfire restoration, even if some challenges remain regarding the integration of social priorities into operational decisions. Finally, deepening the transdisciplinary content of participatory wildfire governance can increase its transformative potential.

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