Forest commons responded efficiently – do we understand why?[1]

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ABSTRACT

This contribution aims to analyse the response of private forest owners to an extreme environmental disturbance in the Slovenian karst region in the period 2014–2016. Quantitative and qualitative analysis of empirical forest management data on response time and harvesting time, as well as interpretations of response drivers, led to the identification of forest commons as a fast and efficient type of forest ownership, despite almost a century of state suppression of their local institutions. Among the internal and external response drivers, a norm of responsibility and forest management competence were highlighted. Our study highlights the potential of forest commons for active forest management in Europe. A concerted response from private and state institutions should not only take into account economies of scale, but also traditional knowledge and local social norms.

KEYWORDS

Harvesting behaviour, natural disturbances, climate change effects, forest management, Slovenia

1 INTRODUCTION

The increasing frequency and severity of environmental challenges underscores the need for a collective response (Bodin, 2017). Ecosystems on limestone bedrock are particularly vulnerable to disturbances (Vilhar et al., 2022). Weather-related forest disturbance in Slovenia occurs regularly but on a relatively small scale. In 2014, a large-scale ice storm and the subsequent bark beetle outbreak in 2016 hit the Inner Karst region and stimulated the response of both professional state forest institutions and local forest owners. The inadequate recognition of common-pool resources as public goods motivated our research (Šmid Hribar et al., 2018), so we focused on the Inner Karst- post-disturbance forest management interventions of forest commons (hereinafter FC). They are a local tradition and the best known form of collective action seldom evaluated as a provider of ecosystem services through forest management.

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Activities of FC generally refer to group functioning and property maintenance like infrastructure maintenance and construction, harvesting, initiatives to decision-makers, local investments (Bavec et al., 2021). According to the Agricultural Communities Act (2015), Slovenian FC are formally recognized agrarian communities. Their collaborative activity, joint action and particular governance model in Slovenia has already been presented (Bogataj and Krč, 2014; Premrl et al., 2015; Šmid Hribar et al., 2018; Bavec et al., 2021), as well as related to other European practices (De Moor, 2015; Lawrence et al., 2020; Haller et al., 2021).

This study aims to determine whether FC responded to the ice storm and the bark beetle outbreak in 2016 faster in comparison to other types of forest owners. The hypothesis is that the response of FC was faster than that of other types of private forest owners. The objectives of analysis were 1) to fill the gap in the empirical examination of private forest owner behaviour, 2) to compare the response of FC and other types of private forest owners to forest disturbance and 3) to provide a basis for strengthening the active response to large-scale forest disturbance. In addition, we aimed to get an insight into their specific governance model and presumably its essential element - social norms. Post-disturbance interventions might account for this (Deuffic et al., 2018; Holt et al. 2021) and it is also important in any collaborative governance arrangement, as joint problem identification (e.g., forest management) and negotiated solutions have been found to be effective for socio-environmental sustainability (Bodin, 2017; Tucker et al., 2023).

2 METHODS

The study area was the Postojna regional forest district of the Slovenia Forest Service (hereinafter SFS). Inner Karst is also called the Green Karst for its typical forest cover. The study uses a mixed methods approach, combining quantitative and qualitative analysis. The quantitative part of analysis focuses on the following response indicators:

- **Response time** defined as the difference between the date of realization of the legislative order and the date of its uptake:
  - **minimum response time** refers to the first legislative order,
  - **average response time** refers to the average for all legislative orders, and
  - **maximum response time** refers to the last legislative order.
- **Harvesting time**, defined as the average time difference between the realization of the last and the first legislative order.

Realization of legislative orders, defined as the average time difference between the conclusion of harvest and the deadline prescribed in legislative orders. The forest related data used in this study are derived from the forest management plan for the period 2012–2022 (Zavod za gozdove, 2011) documented in the official database of the SFS. Variables analysed were site and forest stand characteristics and transport distances indicating accessibility. Pearson correlation coefficient were used.

The qualitative part of analysis improved the understanding of the decisions and actions of FC and highlighted the role of social norms. Primary qualitative data were collected by triangulating three methods: semi-structured interviews, focus groups and

surveys. We limited potential bias by iterative communication in the four-year period 2017–2020 and with different target groups, some of which intentionally overlapped (e.g., professional foresters of the SFS, regional forest owners, FC representatives and general regional population). We started in 2017 with pilot interviews and a focus group. In 2018, a web-survey was launched and a repeated focus group were organized. The third focus group in 2019 and the control from the national survey in 2020 tested the interpretations collected in previous years. Interpretation of the qualitative data was based on the framework of Deuffic et al. (2018), who proposed five general decision-making profiles.

3 RESULTS

Nearly 60% of forests in the area are privately owned, covering 47,728 ha (Zavod za gozdove, 2011). Private properties are fragmented into plots that are predominantly between 10 to 30 hectares big, which is larger than before denationalization. Forest management is attributed to the SFS according to the Forest Act (1998).

Three general problems of private ownership in the area are low motivation and inactivity, poor road infrastructure and the strong influence of wildlife, particularly that of large predators (Zavod za gozdove, 2011). There were 49 FC in the Postojna district in 2011 (Zavod za gozdove, 2011), and 46 according to the SFS archives in 2017. FC own forests at the least productive sites, once pastures in the total amount of 4,300 ha. The share of their land in the Postojna district is 9%. Their properties are located on the least productive sites 9% (4,300 ha) of the district forests. Part of these sites were planted with spruce before Second World War. FC can be considered as large forest owners, as most of their properties exceed the average size of individually owned forest land.

Legislative orders prescribed a total of 1,264,680 m3 of timber harvested after the ice storm and 694,906 m3 after the insect infestation in the Postojna district. The average harvest per legislative order was 4.2 times higher for FC than that for other private forest owners after the primary disturbance and 1.4 times higher after the secondary disturbance. Only 4% of the required timber harvest was not realized on disturbed FC plots, while other private forest owners left 57% of the prescribed harvest. Fully mechanized harvesting was FC's dominating approach. For other private forest owners, motorised manual harvesting prevailed. FC were efficient in terms of speed and focused decisions. For example, they primarily focused to conifers and minimized bark-beetles gradation that followed. Interestingly, average response time declined with increased skidding distance ($r = -0.23$, $p < 0.05$). FC with numerous legislative orders started significantly earlier ($r = -0.35$, $p < 0.05$) and their response time for the last legislative order was significantly longer ($r = +0.42$, $p < 0.05$). The average response time of larger FC was significantly lower ($r = -0.25$, $p < 0.05$).

However, short harvesting time was not only attributable to relatively large parcels or to the quick response, but also to other factors. Qualitative analysis clearly informs on competences gained in several past ice storm events of small scale and on ownership responsibility. The qualitative data consistently, and sometimes explicitly, suggest that social norms were the main driver of collective action of FC. A redundant question in our

inquiry asking who the main driver of the response was, yielded responses of »ownership responsibility« (77%), which is indicative of social norms, and »income potential« (43%), which is ultimately subordinate. Furthermore, a higher share of subsidized pastures, indicating the active management of the FC, stimulated action, while the sudden loss of a FC leader suppressed it.

4 DISCUSSION AND CONCLUSIONS

The decision-making process in forest management is becoming increasingly uncertain due to the effects of global warming. When land is predominantly privately owned, as is the case in Europe, swift intervention of private forest owners becomes crucial after natural disturbances. Studying the response of FC to extreme natural disturbances is beneficial because FC members share land and path-dependent relationships (Gatto and Bogataj, 2015; Šmid Hribar et al., 2018). They are large forest owners in the study area and in Slovenia. The share of their property type in Postojna area is three times higher than the national share (Premrl et al., 2015). Their property is less fragmented than other private properties. Furthermore, their interpretation of the extreme event was not catastrophic, in contrast to the shocking reports in the local and national media. Most members are over 60, experienced and cooperative (Bavec et al., 2021) but not equipped with safe and efficient mechanisation. Therefore, not only a large-scale forest disturbance but also legislative orders represented a sudden and substantial pressure because of large amounts of damaged wood and deadlines to be followed.

Harvesting was realized quickly, within prescriptions, and with 56% of the operations using mechanized harvesting, which is substantial in comparison with 10% mechanized harvesting done by other types of forest owners.

FC forest management decision-making competence developed through learning loops during regular ice storms of smaller scale, which resulted in an effective response to the sudden large-scale event. The fast response of older, experienced forest owners hypothesized by de Groot et al. (2018) was therefore not a surprise. New insights into joint forest management based on this analysis inform not only on experiential knowledge but also on elected leadership, (presumably) green competences (Bianchi et al., 2022) but still, on both, active and inactive FC. Active FC reacted immediately, changing their initial decision from training to hiring machinery services and efficient fulfilment of both, private and public duties (focus group 3; Šmid Hribar et al., 2018). For example harvesting prevented bark-beetles gradation and contributed to safe access to forests (in Slovenia citizens have free access to forests). Prescriptions played only a minor role which is in contrast to findings of de Groot et al. (2018), while relatively large plots and the amount of sanitary felled spruce were important. Response was limited where plots were inaccessible and/or the internal cohesion of FC was sometimes dysfunctional. The active and rapid response of FC is an interesting finding given the decades of their suppression (Bogataj and Krč, 2014; Premrl et al,. 2015), the general attribute of passivity of forest owners and the low public awareness of FC at the local, national (Bavec et al., 2021) and European level (Lidestav et al., 2017; Lawrence et al., 2020). Since FC prioritized conifers after the ice storm, bark beetles later caused few problems. Despite suboptimal response of individuals, past investments by FC in

self-organization and governance generally resulted in a comparatively better harvest response to an unexpected extreme event. Importance of social norms has already been highlighted in the international literature (e.g., Holt et al., 2021). As FC have not yet been analysed in relation to harvesting behaviour, identification of their key drivers might be important for future post-disturbance strategies:

- Economies of scale (also taking into account site accessibility, location and proportion of spruce);
- Social relationships (internal FC cohesion in terms of trust and social capital);
- Group action, its leadership experience and competence.

As communities of practice, FC regulate forest management and relationships, and practice collaborative governance (Bodin, 2017). They prioritize leadership quality and reputation over the number of members. They are able to mobilize experiential knowledge from past ice storms which is their important strength. Structural indicators do not provide the best insight into the qualities of FC.

The justifications for the active response are clearly in agreement with the theory of communicative action and practice theory (Deuffic et al., 2018; Wenger, 2000). Furthermore, the logics of cognition and practice described by Deuffic et al. (2018) were more important than those of interest and appropriateness that support eventual conformity to imposed rules. The findings do not oppose those of another model developed in Slovenia based on individual data about forest management conceptualizations (Ficko, 2019). However, there are some limitations of the study, for example the fact that the sample covers less than half of private forest owners in the study area and only part of FC. Furthermore, generalizations are limited by the high degree variation in FC functioning, unevenly spread response: some self-organized, while others waited for state measures or the action of neighbours. The role of the wood market and insurance was not analysed nor mentioned in the qualitative observations and there are challenges with internal cohesion that has been eroded during the Second World War and in the undemocratic regime that followed. Competent individuals are not equally distributed and may be marginalized. We cannot draw definite conclusions about the importance of age due to a lack of data on the social structure of the FC. A challenge are also non-respondents in the qualitative analysis and diverse reasons for inactivity. Further analysis should compare equal sizes of individual and collective private properties and contextual analysis through systematic long-term observation.

Generally, large-scale environmental extremes represent a push that mobilizes diverse actors. The main factors influencing the response of private forest owners were norms, the environment and competences of forest owners. Although owners' competences can be problematic in a society in transition (Premrl et al., 2015; Lidestav et al., 2017; Theesfeld, 2018; Šmid Hribar et al., 2018; Vasile, 2019; Weiss and Nichiforel, 2020), our analysis presents that a vibrant and partly self-organized rural society is able to build shared meanings and actively respond. This may also be a relevant model for other European contexts (Vriens and De Moor, 2020). However, unfortunately FC in Slovenia are currently recognized as examples of good practice and sometimes as owners of relatively large properties, rather than as a model as proposed in the European literature (Lidestav et al. 2017; Weiss et al., 2017; 2019; Lawrence et al., 2020).

Regional empirical data on the post-disturbance forest management intervention of FC provide insights into their effective response through their immediate and rapid collective action. They harvested damaged coniferous forest stands with machinery services well before the deadline and before other forest owners (except large individual forest owners). Iterative qualitative assessment shed light on various response drivers, including social norms of responsibility and forest management competence. This means that even if some FC remain dependent on external empowerment, most have revived the traditional collective action of FC and shifted from passive to active. The practical implications of this analysis lie in organizational approaches in the wake of natural disasters. Professional, timely and efficient private forest owner response requires the following:

- Avoiding generalized measures for artificial target groups in favour of contextualized real local communities.
- Recognizing and supporting existing FC and the pre-conditions for their collective action.

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