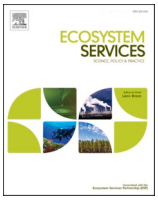
Ecosystem Services 52 (2021) 101380

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser



Full Length Article

Piloting a more inclusive governance innovation strategy for forest ecosystem services management in Primiero, Italy☆

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ARTICLE INFO

Keywords:
Policy entrepreneurship
Participation
Governance innovation
Managing governance setbacks
Multifunctional forest management
Multiple Streams Approach

ABSTRACT

Forests are increasingly recognized for their role, importance and multifunctionality in terms of provisioning, regulating and cultural ecosystem services they provide. Even if timber production remains the most economically valuable provisioning service in Primiero, the importance of and need for multifunctionality of forests is acknowledged. This article analyses the development of Forest Ecosystem Services (FES) governance innovation strategies by the Provincial Forest Agency as a policy entrepreneur in the area of Primiero, in Trentino, northeast of Italy. Based on detailed case study material, we create the heuristic of Kingdon's three streams model in order to reconstruct the development of and negotiations around the introduction of innovative approaches to the problem, policy and politics levels and to identify the chosen or missed windows of opportunity to deliver innovation in FES management. Findings show that the main issues perceived by the local stakeholders concern loss of biodiversity, of cultural identity and historical landscape values. The policy-entrepreneurial initiatives undertaken by the Forest Agency represent a governance mix of direct project execution, financial incentives, organisational incentives and information-based activities. The results highlight its efforts to move beyond the traditional top-down approach based on widely available public funds and towards coordination and collaborations among stakeholders, contribution of private investments, bureaucracy simplification and interconnection between participatory and institutional processes.

1. Introduction

Forests are increasingly recognized for their role, importance and multifunctionality in terms of provisioning, regulating and cultural ecosystem services they provide (Plieninger et al., 2013; Saarikoski et al., 2018; Orsi et al., 2020). They figure prominently in the European Union (EU) Forest Strategy 2014-2020 and are emphasised in the European Green Deal and the proposal for a EU Forest Strategy post 2020 (EC, 2013, 2019; Primmer et al., 2021). Following Huang et al. (2015: 140), "multifunctionality is used with reference to "ecosystem function" or "landscape function", which is defined as the ecosystem or landscape capacity to provide goods and services". Specifically, with regards to forests, multifunctionality is defined as the joint production of multiple environmental, social and economic benefits from ecosystem functions in a given land area (Seidl et al., 2016) and it is recognised as the key factor to make forests more resilient and to advance their sustainability (García-Nieto et al., 2013; Lazdinis et al., 2019; Ellison et al., 2017; Sheppard et al., 2020). Therefore, the adoption of a forest management approach that incorporates all forest functions in a balanced way and aims to enhance them all equally is crucial to ensure forests' vital ecosystem services to function correctly and grant people the possibility of enjoying all benefits they provide.

☆ The work for this paper was funded by EU Horizon 2020 project InnoForESt GA no. 763899.

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https://doi.org/10.1016/j.ecoser.2021.101380
Received 15 April 2021; Received in revised form 18 October 2021; Accepted 22 October 2021
Available online 15 November 2021

This contribution analyses the development of forest ecosystem services (FES) governance innovation strategies. It focuses particularly on governance mechanisms at sub-national level. Mindful of the Common International Classification of Ecosystem Services (CICES) widely accepted ecosystem services categories (Haines-Young and Potschin, 2013), we present a case-study in the mountain region of Trentino in north-eastern Italy and focus on the role of the Trentino Forest Agency as a policy entrepreneur (see section 2 for a detailed description of the Forest Agency). Even if timber production remains the most economically valuable provisioning service in Trentino, where forests cover 63% of the surface, multifunctionality of forests is well-known in its political and forestry sector (Gottardo et al., 2020). Indeed, the 'nature-based silviculture approach' applied in the region promotes *provisioning* FES (e.g., wood, berries, mushrooms), *regulating* FES (e.g., watershed protection, air quality regulation) and *cultural* FES (e.g., emotional values, education, outdoor recreation) simultaneously. Other than previous approaches focusing predominantly on wood production based on even-aged, clear-cut systems, this forest management strategy makes use of natural ecosystem processes to balance the multiple functions of the forest and assure the persistence of a healthy ecosystem (O'Hara, 2016). It relies on trees' natural offspring, biodiversity, multifunctionality, sustainability and use of indigenous species.

After World War II, socio-economic changes and political decisions benefitting industrial development resulted in a gradual abandonment of mountain pastures and meadows traditionally used for mowing and cattle grazing. These processes led to forest recolonization and required a more active management of forests (Niedertscheider and Erb, 2014; Tattoni et al., 2017). In the past decade, corresponding to recent conceptual and practice developments (Secco et al., 2011; Secco et al., 2017), the Forest Agency has been involved in delivering forest management and governance innovation through the adoption of participatory processes to propose governance alternatives, influence decision-making and ensure that all FES are supplied by forests in Trentino. The Forest Agency took the opportunity to join a EU-funded project (2017–2020)[1], intended to promote FES governance innovation. This project represented a favourable condition and context to strive for innovation in itself. It aimed to develop innovation strategies by enhancing the multifunctionality of forests and targeting the valorisation and provision of FES, including those which are often not recognised by traditional markets.

The objective of this article is specifically reached by answering our research questions:

- In which ways has the Forest Agency governance innovation strategy influenced recent FES governance decisions in Trentino?
- How do policy entrepreneurs contribute to innovating ecosystem services governance in complex historical and institutional environments?

To address these questions, we used qualitative methods such as semi-structured interviews and participatory workshops, to both define the constellation of stakeholders to be engaged and identify governance problems and alternatives. The central theoretical approach to analyse the role of the Forest Agency in the development process of the FES governance innovation in Primiero is Kingdon's (2014) Multiple Streams Approach (MSA; Rosa da Conceição et al., 2015). It explains how FES governance outcomes occur due to the influence of actors and coalitions such as public officers, local associations, SMEs, and highlights how participatory processes can foster change in FES governance, and shows how frictions between politico-institutional processes and perceived governance problems and solutions affect the innovation strategy development process. We chose the multiple streams perspective to understand how FES governance innovations come about as it postulates that issues become prominent on government agendas when three usually independent streams – problems, policies/solutions and politics – converge to open windows of opportunity (Bouwma et al., 2018; Howlett et al., 2009). This window allows interest groups and policy entrepreneurs to advocate for preferred policies and finalize their efforts to promote significant governance change (Hrabanski, 2015; Mintrom and Norman, 2009).

The article is structured as follows: section 2 briefly introduces the case study context in physical, institutional and demographic terms. Section 3 deals with relevant literature from a policy entrepreneur as well as from a FES governance innovation perspective. Section 4 presents the methods used in this study to examine the role of the Forest Agency in fostering FES governance innovation processes and results are reported in section 5. Finally, section 6 discusses the relevant results and conclusions are drawn in section 7.

2. The innovation's institutional and physical context

Trentino has benefited from a special statute of legislative and administrative autonomy since 1948 (Constitutional Law n. 5/1948 and Presidential Decree n. 670/1972), which is the result of a complex interplay of secular traditions, rules, and civic uses that owe their distinctiveness to the cross-border location between Italy and Austria, and Trentino's belonging to the Austrian empire until 1918. The provincial government of Trentino exercises its authority through departments, services, agencies and specific units of mission. The Forest Agency is one of the services affiliated with the Civil Protection, Wildlife and Forest Department (Forest Department), whose role is mainly the coordination, supervision and definition of guidelines for the underlying services. These services maintain a wide freedom of action, decisional power and availability of resources, which they are allowed to use autonomously. The Forest Agency includes 37 local forestry stations, organized in 9 forestry districts, which refer to the headquarters located in Trento.

Primiero, a mountain region located in the north-eastern part of Trentino, is renowned for its centuries-old rural tradition based mostly on the production of cheese and butter, and local raw material originated by hay and grass of alpine meadows and pastures. Until the early 1900s, excessive grazing in the woods and in open areas created problems for forest cover and land management, as testified by the attempts to stem the phenomenon through different laws since 1558 (Zanella et al., 2010). In the second half of the twentieth century, the gradual regularization in use of forest resources, the growing awareness for environmental protection, industrialization and sustained outmigration processes determined a gradual recovery of Primiero's forests accompanied by a gradual abandonment of mountain pastures and the consequent wood encroachment (Turri and De Ros, 2006; Tattoni et al., 2011; Tattoni et al. 2017). In general, the Trentino population living in the 751–1,000 m altitude has steadily declined from 17.9% in 1921 to 11.4% in 2011, while the population living over 1001 m of altitude has decreased from 8.1% to 6.4% in the same period (ISPAT, 2017). Similarly, the population working in the agricultural and forest sectors steadily decreased since 1951 (Tattoni et al., 2017).

Between 1960 and 2015 the total forest growing stock almost doubled in Primiero forests increasing from 3,336,357 to 6,322,134 m^3 (Della Giacoma, 1992; Gottardo, 2015). This phenomenon of forest recolonization was particularly evident in the last three decades of the last century. It is quite certain that the forests thrived due to the nature-based sylviculture approach, which the Forest Agency enacted to ensure a sustainable management of the forest (Wolynski, 2009). An analysis of a series of historical aerial photos of Parco di Paneveggio Pale di San Martino and surroundings, which can be considered a good proxy for Primiero as a whole, estimated that forest cover was around 41% in 1954, 49% in 1994 and 52% in 2006 (see Fig. 1 below; Tattoni et al., 2010; Tattoni et al., 2017; Tattoni et al., 2021). Wood encroachment had

[1] For double blind peer review purposes the Project's name is not mentioned at this stage.

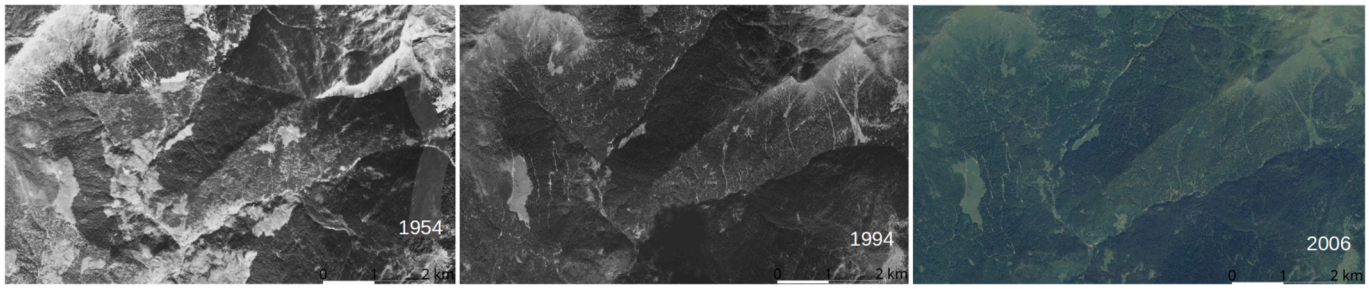

Fig. 1. Forest recolonization process in Primiero, 1954 - 1994 - 2006.

an expansion rate of around 11% (Gasparini and Rizzo, 2015; Servizio Foreste e fauna, 2016; Gobbi et al., 2019).

Unfortunately, forests also reclaimed open areas in the process, whose existence is extremely important to maintain the equilibrium and the natural richness in alpine landscape (Giovannini, 2017). Open areas and wooded pastures are indeed considered as crucial and integrated elements of the forest ecosystem, which require attention and targeted intervention, in order to preserve general multifunctionality of the forestry environment (Gottardo et al., 2020).

To counteract the consequences of undesirable recolonization in the alpine landscape, in 2014, an initiative by the director of the forest district of Primiero realised a one-year demonstration project fostering agro-silviculture. Funded with provincial budgets, this project was a collaboration with the Forest Agency and involved three agricultural firms. From 2014 to 2018, the restoration of 61 ha of meadows was attained through the cutting of the newly formed woods and the recovery of turf grass. The relaunch of this traditional management system has become part of the strategy of the Forest Department (Giovannini, 2017; Gottardo et al., 2020), which strongly believes in the crucial role played by agro-ecosystems in the preservation of biodiversity and enhancement of forest multifunctionality through the historical balance between open areas (e.g. pastures and meadows) and wooded areas that is so characteristic for traditional alpine landscapes (Assandri et al., 2019; MacDonald et al., 2000; Brambilla et al., 2015). The strategy aimed to support both rural development and local tourism, opening up new opportunities for economic development while hindering the depopulation of mountain communities.

3. Theoretical framework: forest ecosystem services governance innovation and policy streams

Although methodological and conceptual innovations in Forest Ecosystem Services are still viewed on their own (Vallecillo et al., 2019; Vangansbeke et al., 2016), they have recently been more and more incorporated into research on various aspects of innovation (Ludvig et al., 2021; Sarkki et al., 2019a; Sarkki et al., 2019b) and societal challenges (Fady et al., 2015; van Noordwijk et al., 2018). Furthermore, attempts are made to incorporate ecosystem services in social science methods exceeding economic valuation such as stakeholder analysis (Juerges et al., 2020; Raum, 2018; Stegmaier et al., 2021, *in this special issue*). Not least since the explicit reframing of the ecosystem services notion to reflect the socio-ecological aspect of human-environment interactions (Díaz et al., 2018) and the participation of a broader range of stakeholders seem to become more prominent (Hayter and Clapp, 2020; Purkus and Lüdtke, 2020; Van Noordwijk et al., 2020). The case study presented here is an amalgam of these participatory innovation processes that have actual governance impact. Thus, we approach the process analysed in Trentino as a case of FES governance innovation process (Sorge *et al.*, *in this special issue*) promoted and facilitated by a central actor like the Forest Agency that tries to involve stakeholders more than before.

How governance[2] innovations come about has been a matter of continuous interest (Rhodes, 2007; Moore and Hartley, 2008; Smits et al., 2010; Boekholt, 2010; Rip, 2012; Schot and Steinmueller, 2018; Edler and Fagerberg, 2017; Edler et al., 2016). Prevented by the complexity of the context in which they occur (Geels, 2019; Rip, 2012; Bevir, 2011), governance innovations have proven resistant to deterministic, predictive 'if-then' theorizing in favour of more open-ended, context-oriented and processual approaches (Kuhlmann et al., 2019; Van de Ven et al., 2008; Geels, 2002; Voss et al., 2006). One consequence of this complexity is that one no longer assumes direct controllability, but understands "governance" as a task of framework setting, coordinating and cooperating (Pressman and Wildawsky, 1973; Mayntz, 1998; Mann and Simons, 2015). This constitutively includes the involvement of affected or otherwise relevant stakeholders in the governance process.

Innovating governance while including stakeholders has in Italian forest governance scholarship (cf. Secco et al., 2017) been associated with network-based governance (intra- and intersectoral stakeholder networks). This includes firstly the delegation of power and resources from the central state to the regional/local governments and secondly the involvement and empowerment of local stakeholders, networks and communities in management and decision-making. In this context, some failures were observed, which are attributed to the failure to switch from a relatively static and dirigistic to a dynamic and power-sharing approach (Secco et al., 2017: 80). The indicator that such decentralisation and flattening of hierarchy works is how well it is possible to provide sufficient institutional framework conditions for trying out and learning between the stakeholders involved (Secco et al., 2017: 92; Andersson, 2006: 33; Stirling, 2008; Dryzek, 2009; Irwin, 2006; Te Kulve and Rip, 2011; Stegmaier, 2009). This is where the project in Trentino starts with a procedure that offers the chance to consistently offer non-administrative stakeholders extensive opportunities to participate in the development of innovation (Stegmaier et al., 2021, *in this special issue*).

For the analysis of the Forest Agency's role in the development process of the FES governance innovation in Primiero, we apply one such approach: Kingdon's (2014) Multiple Streams Approach. It functions as a governance heuristic (Abbott, 2004) aiding the understanding of governance processes as well as policies and how they are brought to

[2] Since we combine different theoretical approaches, the terms 'governance' and 'policy' are used in the following way: we start from a broad governance term that describes the relationship between the most varied of stakeholders, institutional arrangements, processes and instruments beyond the purely state-run government work. We use the policy term where it is obvious from the use of the respective specific concepts (policy entrepreneur, policy stream, etc.).

life through governance change (Sabatier and Weible, 2014). This approach sees changing patterns of governance as a combination of "structural forces and cognitive and affective processes that are highly context dependent" (Zahariadis, 2014: 26). The Multiple Streams Approach distinguishes five core elements. The first three are problem stream, policy stream and politics stream. The problem stream hosts all issues that are not only perceived by stakeholders but also strategically portrayed as such (Stone, 2002). Defining a problem as "a gap or disparity between a moral standard and an image of a present or future state of the world" (Hoppe, 2010: 66) illustrates that what counts as a problem is based on the perspective of stakeholders (Kingdon, 2014: 110). The policies stream contains all ideas that may help alleviate problems. Although what is perceived as a problem also limits the range of acceptable solutions to that problem, there are still myriad conceivable solutions to governance problems that depend on the outlook of stakeholders. In the politics stream the "national mood, pressure-group campaigns, and administrative or legislative turnover" converge as expressions of the socio-political landscape (Zahariadis, 2014: 34). The same applies to regional and local contexts. In principle, these streams are thought to be independent from each other. However, in specific situations all streams may be coupled to produce policy windows – "opportunities for action on given initiatives" (Kingdon, 2014: 166). During a policy window, policymakers can actually get things done. Types of policy windows relevant here are "discretionary political windows", which are based on often relatively unpredictable initiatives of individual policy actors, and "random problem windows", which are unpredictable and triggered by random events or crises (Howlett et al., 2009). Finally, policy windows can be utilized or even created by policy entrepreneurs, who invest specific kinds of resources (Kingdon, 2014) and possess specific characteristics in terms of scanning and governing the politics stream, as well as strategically defining problems and solutions (Mintrom and Norman, 2009; Aukes et al., 2017). In order not to be misunderstood, the approach does not assume that there are no setbacks (Loft et al., 2020). Opportunities can be used in the sense of what is desired, but do not have to lead to what is desired.

4. Methods

The methods included two main phases, data generation and data analysis. Within the data generation, four main steps were taken: i) Socio-ecological-technical-forestry-innovation-system (SETFIS) and governance analysis; ii) stakeholders selection, where the role and experience of key informants were essential to identify key stakeholders to be interviewed and invited to workshops in the next step; iii) participatory process and workshops with the purpose of identifying new problems, potential alternatives and key decision moments where alternatives could be brought in; iv) these inputs were integrated with data from policy and project documentation with the aim to reconstruct and reinterpret the FES innovation development process through the multiple streams model as the data analysis framework (Fig. 2).

Earlier in the project, a detailed stakeholder analysis was carried out to identify the key stakeholders involved in and/or affected by the FES governance innovation in the Primiero area (Annex A) (*cf*. Schleyer et al., 2018). Additionally, fourteen semi-structured interviews were conducted with key stakeholders as identified via key informants (interviews of about 40 minutes each; model in Annex B). The interviews aimed to investigate perspective, interests, concerns and interrelations between the stakeholders, to better prepare the future workshops. The interviews were conducted as much as possible in the working environment of respondents, adapting the questions to the context and to each interviewee.

To get a comprehensive idea about the starting situation, a SETFIS analysis with a focus on governance innovations in forestry (Sorge et al., 2021) and a governance situation assessment (GSA) were also performed (*cf*. Aukes et al., 2019). These dealt with stakeholder relations, the history and current state of the innovation efforts, and a scan of trends expected for the development of the innovation. Additionally, the GSA also highlighted the structure of the key problems (Hoppe, 2010) to be handled in the course of the governance activities. The socio-ecological-technical analysis framework presents an integral approach with which a multidimensional and context-sensitive framework was established and applied in the project. It should also ensure that no relevant group of factors that influence the governance approach is overlooked, which would result in unrealistic assessments of the opportunities and limitations of FES governance change. The GSA was used in the project to allow all participating partners in the regions to focus to the same extent on the previous history, the current situation and the current development trends on the one hand, and on the other hand on the key issues on which conflicts, ambiguities, uncertainties or even consensus can be identified. This should also help to avoid surprises in the respective concrete case due to overlooked problems or commonalities.

This study also employed a participatory approach as the backbone of the innovation work in the region. Three major workshops were held in January, May and December 2019. The approach applied was the Constructive Innovation Assessment with the aim of bringing a variety of relevant stakeholders together and facilitating their contributions to the innovation through constructive dialogues. The particularity of this approach is that it entails developing alternative scenarios for the innovation together with stakeholders whose selection is also based on the aforementioned analytics, such as GSA (Stegmaier et al., 2021, *in this special issue*; Aukes and Stegmaier, 2020). Stakeholders did not only brainstorm and discuss, but even before they met for the first time, the interviews allowed the project to clearly take into account the views and interests of the participants from the start and in the scenarios. The meetings were held at the Primiero Community Centre. The stakeholders identified in the previous stakeholder analysis (Annex A) were invited to take part in the entire participatory process (average attendance of 25 participants), except for sawmills and woodsmen, who were not invited to attend the last workshop due to the Vaia storm-related emergency, which changed their priorities and decreased their interest in the process. The first workshop consisted of a breaking-ice meeting, which aimed to introduce the purposes and the topic of the governance innovation strategy and to lay the basis for a stable and fruitful collaboration among the stakeholders. The feedback to the first workshop combined with the outputs of a subsequent internal discussion brought to the definition of scenarios, based on arisen problems and policy alternatives, which were then discussed and analysed in the second workshop with the aim to start to reflect on limits and impacts of the innovation. In the last workshop the participants reflected on the interconnection between the two scenarios selected, on the goals of the innovation and on the factors, both negative and positive, which were deemed crucial for the future development of the innovation, in the short, medium and long term, by group and individual activities. The contribution of an external advisor was crucial for the participatory process, in which the members of the Forest Agency were a party and had a stake, thus could not act as moderators themselves.

For the policy document analysis, different types of documents were used: the report of States General of Mountain (SGM; Provincia Autonoma di Trento (PAT), 2019), a participatory process organized by the provincial government of Trento, which involved all the mountain communities of Trentino in 2019; provincial laws; press release and articles; websites and informal talks with public officers expert in the field. Besides, the entire documentation of the EU project was revisited, such as workshop reports (Aukes et al., 2020), stakeholders interviews, and reconstruction of the entire innovation journey as presented in Loft et al. (2020) tracing main stages of the innovation strategy history; furthermore, the transcriptions of the stakeholders interviews carried out for the Trentino project.

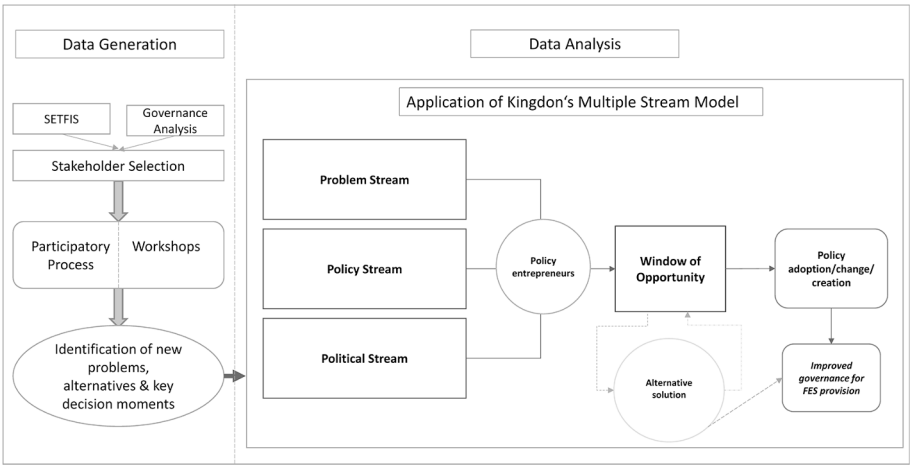

Fig. 2. Flowchart of the whole research process.

5. Results

In this section, we report on the results of the analysis with an explicit focus on the role of the Forest Agency as a policy entrepreneur and facilitator of innovation in FES governance and management for the period from approximately 2014 until 2020. Specifically, the different streams of action (problem, policy, political), together with the advocacy coalitions, allow us to see the actual windows of opportunity in which next steps have been decided. However, this focus on problems, policy alternatives and decisions as they have been identified and analysed in the four-year period does not neglect the acknowledged long-standing issues (e.g., abandonment of mountain areas and depopulation) which have characterised the region of Primiero since the 1950s, but rather builds on them to explore and identify recent problems, alternatives and actions at the basis of the sought innovation. The streams are pivotal to explore the double role of the Forest Agency in delivering governance and management innovation for FES. In which respects this occurred can be sorted with the help of commonly accepted FES categories (*cf.* CICES, Haines-Young and Potschin, 2013) that fit with the empirical case at hand. The section is therefore organized in: i) cultural FES; ii) provisioning FES; iii) regulating and maintenance FES and iv) a final cross-cutting category multifunctionality of forests and cross-cutting questions.

5.1. Cultural FES and drivers of change

Loss of historical landscape values (1.1)[3], loss of cultural identity and interest in rural activities by youth (1.5), and decrease of tourism attractiveness (1.10) have been recognized during our interviews as cultural FES issues in the problem stream (Annex C, column 1). These issues are deeply interconnected with loss of pastures and meadows and dependence on imported grass for cow breeding (1.3) analysed as provisioning FES in section 4.2. All are the consequence of abandoning mountain communities and they prevent the realization of Primiero's high potential for cultural and provisioning FES.

5.1.1. Loss and rediscovery of historical landscape values

The loss of historical landscape values is a long-standing problem that dates back to the 1950s, stemming from complex socio-economic and demographic processes (see section 1.1), which requires a long-term transition. Nevertheless, such problems appeared pressing only with the publication in 2014 of "Ten actions for the rural landscape of Trentino" (Osservatorio del Paesaggio (OP), 2014) by the Landscape Observatory of Autonomous Province of Trento. Hence, loss of historical pastures and meadows started to feature on the governmental agenda and the provincial government of Trento tried to address it through the implementation of a governance strategy based on active forest management to preserve agro-forestry ecosystems and related cultural heritage (2.1). Initially, the Forest Agency included the valorisation of existent wooded pastures, alpine meadows, pastures and *malga*[4] in the Rural Development Plan (RDP) 2014–2020 through the operation "Recovery of habitats in regressive stage". The turning point, however, was the intervention of the director of the Primiero forest district. He identified these political circumstances as a window of opportunity to concretely face the loss of meadows and pastures. Utilizing provincial government funds, the director planned a one-year demonstration project in collaboration with local breeders, forest owners and provincial institutions, restoring 9 ha of historical meadows and pastures. The project demonstrated the feasibility and effectiveness of this type of intervention and paved the way for the development of a new plan for the management of open areas, published in 2015 (Provincial Council resolution n. 921/2015), involving local communities and several provincial government bodies. The plan laid the foundation for further restoration projects across Trentino, as provincial resources for restoring the rural and mountainous environment were added to the Landscape Fund (2016–2018). In Primiero, 61 ha of pastures and meadows have been restored with the participation of fifteen local farms who committed to ensure long-term maintenance and preservation of newly restored areas. The Primiero experience was a good example for the following restoration works implemented by the other forest counties, municipalities and private owners can learn for further restoration work.

Another window of opportunity to relaunch the topic of traditional landscape restoration is represented by 'Vaia' Storm. At the end of October 2018, Eastern Trentino was hit by wind gusts reaching speeds up to 190 km/h and destroying 19,500 ha of surface, resulting in about 4,000,000 m^3 of fallen wood (Provincia Autonoma di Trento (PAT), 2020). After first interventions to manage the emergency situation, the forest's state stimulated discussion on the possibility to restore or

[3] The numbers in brackets refer to the position of the respective item in Annex C. The first digit refers to the columns (problem, policy, political, and so on). The second digit links to the item identified in the problem column. Examples: for "1.1", the first digit refers to the problem stream column (column 1) of the table, while the second refers to the item 1 in the problem column. "2.3" refers to policy stream column (column 2), item 3 "*restoration interventions in newly formed wood*" which is linked to item 3 in the problem column.

[4] Traditional name for the complex of alpine shepherds' dwelling, stable, dairy hut and surrounding pastures.

convert destroyed wooded areas into pastures and meadows. The Action Plan adopted by the Forest Agency in January 2019 (Annex C, column 5) validated this possibility in cases where the destroyed areas are functional to the agro-pastoral management of mountain environments and respectful of environmental and economic sustainability criteria (Servizio Foreste e fauna, 2020; Provincia Autonoma di Trento (PAT), 2020). In Primiero, a private forest owner reacted first to the new opportunity. Despite the income from renting the new open areas for grazing and mowing only partially compensates the initial investment, he identified as a major reward the awareness that this intervention will have multiple positive effects such as conservation of the traditional alpine landscape and support for recreation, tourism and rural activities (interview with a private forest owner). Until now, no public funds have been made available for private or public forest owners who want to convert forest areas destroyed by Vaia into open areas. Consequently, from the point of view of the Forest Agency, implemented actions and strategies were therefore worthwhile to foster forest owners' proactivity and to lead to concrete interventions. In Fig. 3 below, we depict how the Forestry Agency acted as a policy entrepreneur (indicated as PE) through the activation of the Vaia Action Plan in 2019, which opened a window of opportunity to the restoration of new open areas.

Among the alternatives expressed by local stakeholders during the participatory process initiated by the Forest Agency in 2017, the necessity of landscape mapping and planning was strongly emphasised. Besides the Vaia Action Plan, in 2019 the Forest Department activated the inactive Mountain and Forestry Plan (MFP), which was introduced in 2015 (and included in the Provincial Law on forest and nature protection 11/2007), and changed its original purpose, aiming to respond to the necessity to support the economic potential and entrepreneurship of Trentino. The MFP was based on a database containing areas for possible restoration of meadows and pastures, including part of the surface affected by the Vaia storm. The areas have been selected on the basis of economic sustainability and technical feasibility, which are critical to effectively promoting the proactivity and enterprise of farmers. There was also a simplification of the bureaucratic procedures for inbound conversions for these areas. To assist with the MFP planning process, each district assembled a technical group to review the preliminary spatial analysis. As the leader of the participatory process in Primiero, the Forest Agency was involved in the technical group for the Primiero forest district. In doing so, the Forest Agency could represent the interests of local stakeholders, contribute to effective and concrete decision-making and simultaneously improve its own participatory process by linking it to the MFP drafting process. The next crucial stage in this process would have been a public conference with a carefully selected list of participants who would have had the opportunity to discuss the proposal. However, the Covid-19 pandemic stalled the MFP drafting process and determined the closing of a time window. This loss of momentum in the summer of 2020 was complemented by the unexpected resignation of the head of the Forest Department, who was strongly committed to reactivating the MFP.

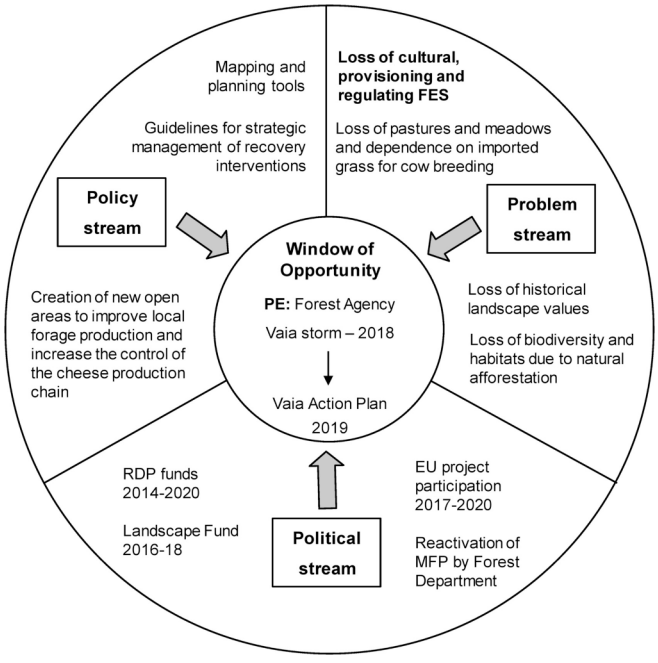

Fig. 3. Forest Agency as a Policy Entrepreneur and activation of a Window of opportunity.

5.1.2. *Decrease of tourism attractiveness and loss of cultural identity*

The gradual transformation of the alpine landscape and the abandonment of traditional rural activities have made the region less attractive for tourism (1.10). From the alternatives presented by the local stakeholders during the workshops (Annex C, column 2), it appears that the combination of landscape protection and revitalization of agricultural values is seen as key to relaunching tourism in Primiero. In Primiero, great efforts have been made to use the cultural and ecological features of the area and to increase the attractiveness of tourism. Various local initiatives to strengthen the relationship between the green economy, nature and tourism (GreenWay Primiero Association since 2015) as well as between the rural environment, food production and tourism promotion (participatory process "Feeding tomorrow" in 2016, in which the Forest Agency was involved as a stakeholder) demonstrate this. The importance of multi-experience and cross-sectoral tourism and the need for a more structural reform of the sector's governance system have been on the government agenda for years. During summer 2020 a draft of a provincial tourism reform bill to encourage niche tourism was presented. However, its impact will only become clearer after the official approval and local implementation.

The loss of cultural identity (1.5) was seriously considered by citizens, rural communities and policymakers after the reports and surveys of the Landscape Observatory, the results of which were later confirmed by the outcomes of the States General of Mountain, a participatory process promoted by the provincial government in 2019 at which all mountain communities of Trentino were involved. Local stakeholders recognized the role of the traditional landscape as historical and cultural heritage and recommended a stronger emphasis on reversing the decay of mountain farming and extensive agriculture (Osservatorio del Paesaggio (OP), 2015). The Forest Agency focused on revitalizing specific elements of the typical agroforestry landscape, such as traditional wood-and-stone fences and the *malga* environment, through specific measures included in the 2014–2020 RDP funds. In parallel, the Provincial Council recently approved an integration of the provincial law of Agriculture (Provincial Law 2–3/2020) which aims to introduce a multi-annual Agricultural Development Program with a long-term perspective, including specific actions to sustain new settlements of young farmers in agriculture, such as mentoring programs and easy access to credit.

5.2. *Provisioning FES*

In terms of provisioning FES (e.g., timber, meadow areas and hay), the main problems identified during our participatory workshops concern: i) loss of pastures and meadows and dependence on imported grass (1.3); ii) forest property fragmentation and its direct impact on reduced timber production (1.7); iii) conflict between beneficiary groups of provisioning FES such as wood companies and hunters (1.8). The role of the policy entrepreneur proved essential in addressing these issues and mediating different priorities of beneficiary groups.

5.2.1. *Loss of pastures and meadows and dependence on imported grass*

The measures of the Landscape Fund and the Vaia Action Plan

carried out by the Forest Agency to restore historical landscape values described in 5.1.1 have helped to address the problems related to the loss of pastures, meadows and reduced production of local hay (1.3). Additionally, the stakeholders stressed that the introduction of a low-waste mowing method and of a cooperative drying system could further reduce this historical problem of the region. The latter could be organised by the local association of breeders of Primiero, which has existed for a long time.

5.2.2. Fragmentation of forest properties

In Primiero, forest plot fragmentation (1.7) is a well-known problem and the origin of subsequent problems. It is seen as a consequence of the law of inheritance, as it emerges from Roman law, which is still legally established in Trentino and in Italy as a whole. This includes the division of property among the heirs. Therefore, land and forest plots are constantly subdivided over time. Rizzo et al. (2019) showed that 468,082 small private forest parcels in Trentino are defined as less than 100 ha of forest area on a total area of 87,504 ha. The forest area of 290,000 parcels is even smaller than 0.1 ha, while each small forest owner has an average of around 4.79 parcels. In Primiero, small private forests make up 16–20% of the total forest area compared to the other valley communities. Many of these hectares remain unmanaged and unexploited, which limits the potential of provisioning FES.

Currently, wood demand cannot be satisfied with raw materials from the local wood supply chain, forcing sawmills and carpenters to turn to foreign wood markets. This also represents a strong inhibiting factor for younger entrepreneurs who demand larger areas, more competitiveness and efficiency. The same applies to public administration and private owners, who have to carry out long-term planning and uniform management of the area in both forestry and agriculture. This problem has been on the government agenda for years and the Trento Provincial Government has taken several decisions in the past to resolve this situation: on the occasion of the RDP 2000–2006, the Forest Agency supported the establishment of forest associations that promote collective interventions on aggregated public or private forest parcels. Later on, the provincial law on forest and nature protection (Provincial Law 11/2007) promoted the establishment of forestry associations, which became an advantage in the acquisition of RDP funds. In addition, in 2015, the provincial government introduced an inventory of public and private unmanaged properties by the Bank of Land (Provincial Law 15/2015), which the owners can temporarily put at the disposal of anyone interested in managing them and exploiting their potential.

Neither of the instruments was fully successful: the full potential of the Bank of Land has not been used and forestry associations were often established with the aim to benefit from privileged funds, seemingly without actually being interested in collective management of forestry properties (source from interview). To counteract this problem, in 2016 the forest authority introduced the obligation for associations to submit a management plan for the legal recognition and payment of funds. The participatory process we conducted helped identify various alternatives to address the problem of real estate fragmentation, including forest cooperatives, forms of temporary occupation of private land for public purposes, or compensation schemes. The debate seemed promising, but the Vaia storm closed the window of opportunity in 2018 and completely changed the agenda of public and private forest owners: addressing the emergency became paramount. During the Covid-19 pandemic and related crisis, thanks to the availability of new provincial funds, the Provincial Council took the opportunity to improve the Bank of Land by integrating the MFP dataset to restart this tool and raise awareness on the issue.

5.2.3. Conflictual role between FES beneficiaries

Another deeply felt issue for wood enterprises is the constant conflict with environmental regulations which restrict their freedom of action and require more complex organizational management. Additionally, tourists and hunters perceive timber harvesting as a disruption (1.8). Because of these tensions and conflicts of interest, the Forest Agency took the opportunity to initiate a participatory process to increase awareness of the multifunctionality of forests and the mutual need for different users to compromise. For this, too, the Vaia storm closed the window of opportunity for the moment, as the priorities on the political agenda shifted and plans were postponed.

5.3. Regulating and maintenance FES

The loss of biological diversity and habitats due to natural afforestation (1.2) led to a general homogenization of the agroforestry landscape and the loss of historical values (see Section 4.1.1). The historical mixture of forests, pastures and meadows that characterised the medium–high mountain environment was a large reservoir of habitats, plant and animal species before it was lost due to abandonment and lack of maintenance. A close relationship between biodiversity and traditional agriculture is often assumed (Marini et al., 2011; Niedrist et al., 2009; Brambilla, 2019; Pittarello et al., 2020). The question was whether local stakeholders and forest administrations would generally recognize this relationship as a goal instead of hindering the recovery of biodiversity and promoting habitat loss.

Since the RDP 2014–2020, specific funds have been made available for the continuation or expansion of the sustainable use of meadows and pastures by farmers in order to maintain or improve the biodiversity of plants in alpine grassland ecosystems. This financial instrument was implemented by both the Forest Agency and the Paneveggio Natural Park in Primiero. In its role as nature conservation authority, the latter attaches great importance to the conservation of biological diversity. The measures to promote the restoration of historical landscape values (see Section 4.1.1) also contributed indirectly to the restoration of a high level of biological diversity. As a result, the readjustment of the Landscape Fund and the reactivation of the MFP were critical to achieving this goal.

5.4. Multifunctionality of forests and cross-cutting issues

Even if the multifunctionality of forests is widely recognized by the scientific community and decision-makers, the majority of FES lacks concrete and effective payment systems, especially when provided by private forest owners (1.9). With the exception of wood, the economic value of which is well recognized in the traditional market, the supply of non-wood FES, such as game, mushrooms and wild berries, represents a negligible source of income for private forest owners. According to the results of a recent survey on awareness-raising, motivation and attitudes of small forest owners in Trentino (Rizzo et al., 2019), family use of forest products predominates and only very few respondents generate income from the sale of firewood (4.4%) and wood (6,3%). The income from the sale of non-wood products is almost insignificant (1.0%). The same applies to regulatory and cultural FES for which no compensation exists or is intended. FES payment systems are not intended to create incentives for the economic use of forest properties. Once the principles of sustainability and multifunctionality in the forest sector are established, the goal is to encourage active management of forest properties, prevent land abandonment and ensure the long-term provision of multiple forest services.

Diverse alternatives have been raised from the discussion with local stakeholders, such as the introduction of compensation schemes, CO_2 certificates, financial support for forest roads maintenance and creation, or sharing of income from mushrooms collection permissions with private forest owners (2.9). The debate is open but the alternatives are still floating in the governance discourses and targeted political decisions have not yet been identified.

Additionally, the promotion of the multifunctionality of forests and sustainable FES management is hindered by several cross-cutting issues. First, the mechanisms in place to maintain the revitalization of rural activities and the restoration of the landscape are highly dependent on

public funds (1.6). Indeed, the public finance system that underlies the restoration of the landscape is well rooted in the history of forest management in Trentino. Already under Austrian rule (1815–1919) each municipality had to repay 10% of the income from local timber sales to the central government, which it reinvested in the area in order to carry out forest improvements and environmental protection measures - a system that still exists. To assure long-term stability and efficiency to the interventions which support forest multifunctionality, workshop discussions have underlined the need to trigger a self-supporting financial mechanism. In other words, this would create a virtuous cycle based on the deep and strong interconnection of rural environment, forest ecosystem and tourism, where each part takes advantage reciprocally (2.9 and 2.10 in policy stream column). In order to reaffirm this self-sustaining mechanism, a strong commitment from the private sector in terms of financial support, investment and moral commitment is essential. The increase in tourism taxes to finance measures to restore the landscape and improve the multifunctionality of forests was also discussed as a local self-financing option, provided this is supported by an appropriate public communication strategy. Nevertheless, this alternative was emphatically rejected by the hotel owners, particularly for bureaucratic reasons. Crowdfunding was another option included in the alternatives that identified citizens and businesses as potential contributors. In this regard, the devastation produced by the Vaia storm opened a window of opportunity for the establishment of this kind of economic instrument: the Forest Agency activated the Trentino TreeAgreement in collaboration with Trentino Marketing, a Ltd company instituted by the Province in 2014 to promote and foster sustainable development and tourism in Trentino. This crowdfunding scheme aimed to raise awareness about nature conservation and landscape preservation and sustain the restoration of the damaged forest ecosystem. Three areas were identified among which Paneveggio in Primiero and reforestation works of 26 hectares started in autumn 2020 (Trentino Tree Agreement, 2020).

Excessive bureaucracy emerged during the workshops as another cross-cutting problem which becomes a hindering factor for private entrepreneur's activities, discouraging local initiatives and delaying the provision of funds. Identification of effective instruments to transfer laws and regulations into concrete results is crucial, introducing more flexibility in management and planning of the territory, reducing the distance between policy and local stakeholders, fostering more collaboration and coordination among the different provincial services. One of the recent decisions taken by the Forest Department was the reactivation of the MFP in 2019. It introduced procedural simplification and facilitated the interventions for pastures and meadows restoration to sustain the local rural economy and agro-forestry preservation. Later on, recent changes to the provincial law of Agriculture (Law 2-3/2020) tried to combine the MFP with the Bank of Land, integrating the two databases containing potential mountain areas to be converted into pastures and meadows and unmanaged rural areas, respectively. This systemic approach contributes to simplify the bureaucratic system, joining two instruments initially introduced for different goals, and increased the effectiveness of policy governance for the management of FES.

The lack of an effective monitoring and control system (1.4) was also a notable problem, particularly in the area of pasture and meadow maintenance after restoration work. This hinders the tracking of the effects of public investment and prevents efforts to restore the historical balance between wooded and open spaces. The Forest Agency addressed this problem by developing a new protocol for the surveillance and control of pastures, based on a more systematic approach and cooperation between different provincial institutions. After approval, the 2020 protocol was implemented for the first time. Based on the preliminary results, the protocol will be improved and refined.

6. Discussion

The innovation of FES governance towards a more multifunctional forest use in Trentino is characterised by an intricate combination of historical, social, institutional and political developments. Inherited elements of Roman law (right of succession) and Austrian rule (tithe on public timber sales), have determined a long-standing tradition of active governmental impact on FES management and strongly shaped FES in terms of organisation, governance, funding and landscape. As our results show, forest management currently relies heavily on public funds which may have led to a lack of proactivity and creativity on behalf of local private forest owners when it comes to financing and organising a more ecologically and economically sustainable FES governance. One of the risks of this dependence on public funds is that they may be suddenly redirected based on sudden changes on the governmental agenda. This may, in turn, lead to uncertainty and potentially even to stakeholders resorting to shorter-term FES governance instruments, while FES governance requires long-term instruments. As such, the governance situation displays aspects of path dependence and policy-instrumental lock-in due to this historical role of government. The path dependence is that forest management in the area is heavily if not mainly financed by public funds, so if sudden changes on the agenda require a redirection of those funds in the provincial budget, this may suddenly bring forest management activities into trouble.

Still, it does not have to be a one-way street. State intervention can initiate and promote private initiatives, and private initiatives can induce the state to help or even rethink. It depends on whether a climate can be created in which state and private activities are compatible with one another in such a way that they stimulate rather than hinder one another. Well thought-out framework conditions for private business and with overarching state goals, for example oriented towards the common good, compatible with private business would have to find each other and enter into a learning process.

Moreover, the autonomous position of the Province of Trento plays an important role. Through this special position, provincial government organisations can act with wide legislative, financial and administrative autonomy in almost all aspects of local relevance, including environmental and economic governance. This is the backdrop on which the Forest Agency of the Province of Trento - and by extension the Forest Department - unfolds its active engagement as the main governance entrepreneur dealing with FES governance in the area.

In the study period covered here, the Forest Agency has combined formal authority with more informal activities. Arguably, its strategy combined financial regulating activities with a set of organisational and informative efforts such as framework setting, cooperation and coordination, and elements of a participatory process, including workshops and consultations (*cf.* Primmer et al., 2021). This strategy of the Forest Agency coincided with the proactivity of Primiero forest district director who was able to create and seize a variety of policy windows when the three streams converged. The fact that most of these were discretionary political windows once again indicates the Forest Agency's bureaucratic room to manoeuvre and the importance of problems perception and portrayal (Stone, 2002). The policy-entrepreneurial initiatives taken by the Forest Agency - sometimes in coordination with other stakeholders (e.g., Primiero forest district, Trentino Marketing) or facilitated by their decision making body (Forest Department) - represent a governance mix of direct project execution (e.g., meadows restoration demonstrator project), financial incentives (e.g., RDP funds for various FES governance purposes, crowdfunding), organisational incentives (e.g., encouraging forestry associations for smallholders) and information-based activities (e.g., participatory process for consultation and co-production to account for stakeholders' perception). The Forest Agency also benefited from the provision or adaptation of policy instruments by its principal, the Trentino Forest Department. These included the introduction of the Bank of Land or the reinvigoration of the Mountain and Forest Plan (MFP) as intermediary databases to facilitate the FES governance process (and eventually also their merger). Especially in the MFP process the Forest Agency skillfully introduced its knowledge and organizational capacity as a participant. Thus, the

activities initiated by the Forest Agency involved both the execution of its formal authority and activation of private forest owners who had been lulled into passivity by centuries of reliance on public governance and funding. This was a way of addressing the disadvantages of the existing governance situation with the means at hand and indicates the instances in which the Forest Agency actually behaved as a policy entrepreneur and how exactly it did so.

Besides the more conventional policy instruments, the Forest Agency undertook a participatory process, beyond the framework of the EU-funded project, which symbolises a collaborative approach. Such efforts have not always been successful (cf. Secco et al., 2017). Through these participatory processes, the Forest Agency stimulated private stakeholders and other public institutions to participate in forest management and FES-related decisions and aimed at defining problems based on the perspective of stakeholders (Kingdon, 2014). This subsidiarity-inspired[5] policy-making approach is reflected in the capillary structure of the Forest Agency, the wide administrative autonomy of the municipalities in Trentino, and the promotion of forestry associations and networks. At the same time, however, we also saw that a great deal of initiative came from the administration and the key person in the policy entrepreneur, while those involved were very busy coming to terms with the storm. Had it not been for the European project, the participation strategy might have been postponed to an easier point in time. The involvement of local stakeholders had to prove itself strongly at the moment of the crisis. We learn from this that one does not have to wait for good weather to come up with new approaches in forest governance, but that one does not get results straight away if not everything is right at the moment. Obviously, the special achievement of the inclusive approach is to have initiated a new style and set an example that one is ready to tackle it differently - to give the local stakeholders room for maneuver. Now it will depend on whether and how the Forest Agency will continue to use it in the future and to what extent the administration will continue to pursue and delegate this approach: setting the framework instead of governing.

6.1. External events as random problem windows

As is common in long-lasting governance processes, also the innovation of Primiero FES governance was confronted with random problem windows, most notably storm Vaia, the Covid-19 pandemic, and givens in the governance situation that are difficult to change. The storm accentuated the problems with the existing forest management approach and excessive fragmentation of forest property. This event turned out to be double-edged. It inflicted considerable damage to the forest areas in the Primiero and surrounding regions, resulting in the diversion of stakeholders' attention, especially landowners and companies in the wood industry, to crisis management dealing with the effects of Vaia on provisioning FES such as wood. These stakeholders were out of capacity to show up at the Forest Agency's participatory events. Vaia closed a window of opportunity to deal with the issues at hand (Fig. 4). However, at the same time, Vaia gave an impulse to the innovation process: it contributed to a higher awareness of the impact of extreme weather events on a broad range of stakeholders in the area as well as to an increased interest in the innovation process of the Forest Agency, as it also revolved around the topic of local resilience. Moreover, the Forest Agency managed to move the conversion of areas damaged by the storm into agro-pastoral areas upward on the political agenda via the Vaia Action Plan.

As a result, Vaia, on the one hand, can thus be seen as an influencing factor acting on the innovation process and making policymaking difficult due to the uncertainty and unforeseeable impacts brought about by the event itself. On the other hand, it opened a window of opportunity to bring the stakeholders closer together to develop solutions together. The Covid-19 emergency that hindered any kind of public and collective events in 2020 was the other random problem window in Primiero. It halted the approval process of the MFP and the final inclusion of the alternatives developed in the Forest Agency's participatory innovation processes into the provincial forest policies. It is like a stress test to see if the approach will survive the crisis. If not, it would be obvious that the approach still has to be better anchored and fed back into the governance structure, in order not to be thrown off track too easily . That is how it is with innovations: they have to endure storms and put down roots.

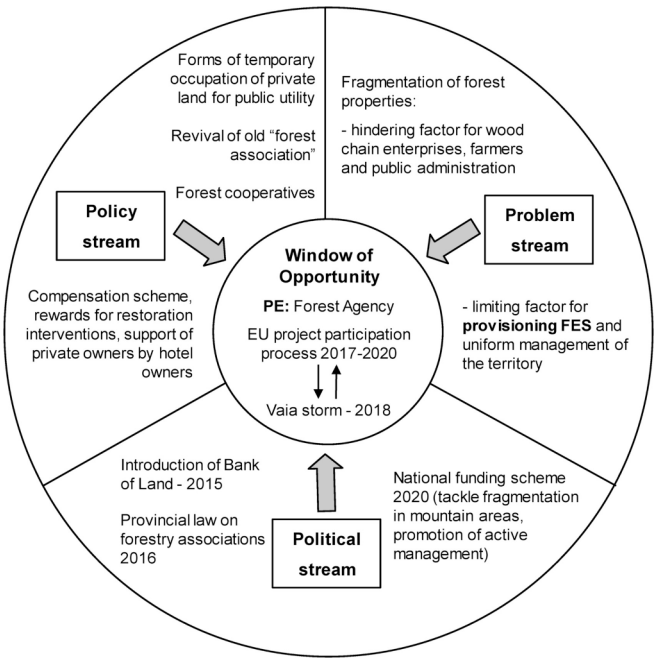

Fig. 4. Impact of an external event (Vaia Storm) on the Window of opportunity.

6.2. Forest land ownership fragmentation and institutional autonomy

Although the institutional history in Primiero (and Trentino by extension) provides considerable bureaucratic freedoms for the governmental organisations including the Forest Agency, it also has detrimental effects on FES governance and attempts to innovate it. In principle, economies of scale apply to FES governance, as the larger the forest area to be managed the more feasible it will be economically and organisationally. However, the right to succession has reduced the feasibility of FES management and complicated it considerably. Not only are forest smallholders often unavailable due to demographic outflux into urban areas, but existing areas are often too small to make planning and execution of cultivation interventions cost-effective (Section 4.2). As a result, potentially valuable FES in those areas do not enter the value chain, but often remain unmanaged. Conversely, in the Province of Bolzano the legal institution of the so-called "closed farm" (*istituto giuridico del maso chiuso*) prescribes the indivisibility of rural properties already since 1526. There, this contributed to preserving a feasible dimension of rural properties, thereby enabling effective FES management. In the rest of Italy, considerable efforts have already been made at national level in order to tackle property fragmentation in the rural and forestry context. Nevertheless, the introduction of specific legal institutions, already from the 60's until the present day, aiming to foster the recomposition of parcels and the effective expansion of rural enterprises, have not proven to be definitive and stable measures. However, in Trentino improved access through an expanded forest road network would make small-batch interventions economically viable,

[5] Art. 5 of the Treaty on European Union and Art. 118 of the Italian Constitution.

despite the overall forestry parcels fragmentation. This social and institutional disadvantage complicates stakeholder management for any actor willing to be a policy entrepreneur in FES governance in Primiero and similar forest areas. If everyone knows about these limitations and there is no plan on how to overcome them, even the most well-intentioned attempts to innovate are doomed to failure. The governance alternatives that will be negotiated further in the future (if the initiative is carried forward) may have to directly incorporate this fundamental change.

The crucial influence of the forest ownership situation and public funding tradition of FES governance contribute to understanding why many efforts by the Forest Agency target the involvement of private forest owners, the historical and traditional landscape, and cultural ecosystem services in general. At first sight, this may be surprising as in Europe innovations pertaining to provisioning and regulating services are the most prominent, while cultural ecosystem services innovations are much less popular (Primmer et al., 2021). On the operational level, this is similar in Primiero. The Forest Agency's approach with frequent site inspections by foresters, mapping, collection and processing of data, accurate elaboration and implementation of planning instruments has proven beneficial for the protection of the main regulating FES, e.g., slope stability maintenance, water quality protection, mitigation of climate change effects. It also leads to good knowledge of the territory and to advise on priorities for FES governance. However, the present analysis of the governance innovation strategy of the Forest Agency showed that the focus shifts when we look at the strategic level. In recent years, the governance emphasis was on innovations in cultural ecosystem services and multifunctionality of Trentino forests, taking advantage of windows of opportunity when they opened. The combination of an operational focus on provisioning and regulating services and a strategic focus on cultural ecosystem services has led to a FES governance strategy rooted in regional traditions based on close-to-nature silviculture that is in place for decades (Della Giacoma, 1992). Such a symbiosis on different levels of activity of the Forest Agency stresses the crucial relationship between the cultural values of forests and their provisioning functions. After all, without prudent governance of the provisioning and regulating functions of the traditional alpine landscape and the local economic development of the mountain region, these core constitutive elements of the cultural ecosystem services in any alpine region would crumble and disappear. By addressing and emphasising the social, institutional and political aspects of the FES governance situation in Primiero, by extension the Forest Agency as main policy entrepreneur targets a more ecological and economically sustainable governance of the provisioning and regulating functions of Primiero forests.

The Forest Agency has significantly influenced all streams through its internal position as a state actor. There is likely to be a potential for role conflicts in this, because the Forest Agency stands for a guarantee of stability, on the one hand, and a willingness to innovate, on the other. How "innovative" it was depended on the difference to what or how it went before. Traditionally, the approach of the Forestry Agency was based on control and regulation, granted by legislation and planning instruments. Recently, as discussed, the Forest Agency tried to be inclusive through dialogue and collaboration with local stakeholders and owners (cf. section 5.1.1). Within the EU project, the Forest Agency moved towards an even more inclusive approach by organizing formal participatory processes, which alongside the technical advisory service are contributing to push forward real changes.

6.3. Dealing with setbacks

Governance is already a daily struggle with many varieties of challenges, unintended or/and unforeseen changes, and centrifugal forces - it remains quite a tentative endeavour (Kuhlmann et al., 2019). Even if one can sometimes control what happens through skillful or routine-based governing, in complex social situations there is actually little chance of having full control (except possibly with massive violence). Our present case from the Primiero is even more difficult, because, firstly, change is going to an economic form that is not consistently so established (i.e., rather new, like the impressive lack of interest in the private sector to invest in the landscape), and, secondly, in addition to the already complex social ones, change occurs under biophysical conditions that also contribute to unpredictable events (e.g., the storm Vaia). Trying to change something inevitably also suffers setbacks (cf. Loft et al., 2020): firstly, the fundamental setbacks in the problem itself (rural exodus, storm), secondly, institutional framework conditions and new political measures are counterproductive (dysfunctional mechanisms, regulation or policy instruments), thirdly, if some stakeholders reject the proposals that have been developed together (that the private sector should invest in land development), and, fourthly, if external circumstances intervene and make the progress of the innovation work difficult or impossible. *Working with progress and regress*, that is what we call the innovation work that is necessary and about which one should not be under any illusions. Although the current innovation project was not a first attempt and has produced entirely new aspects, it was not a sure-fire success. Start-up difficulties (maybe even because it was the third attempt encountering some fatigue), detours, hurdles, disinterest and natural events (storm, pandemic) were just as likely to arise as well-intentioned ideas, experiences and the considerable willingness to discuss and cooperate on the part of the stakeholders. We are not talking about governance failure here, because it is not about an evaluation of the process, but about the practical obstacles when trying to initiate something different.

6.4. Learning from the case

Nature is of a peculiar importance in innovation processes. However, research on policy entrepreneurs regularly does not take into account the biophysical circumstances. This does not mean that it is irrelevant in other places, for example in dealing with weather and climate (Stegmaier and Perrels, 2018: 78-80) or water management (Brouwe and Biermann, 2011; Huitema and Meijerink, 2010; Aukes et al., 2017). Nevertheless, when it comes to changing forest ecosystem governance practices, this is exactly the kind of view that should be taken into account, as our case shows. The importance of such stakeholders in governance innovation processes is shown also in other related studies that show strong interrelations between the actors and the ecosystem (Loft et al., 2020; Sorge et al., 2021).

Constant pressures and extreme weather events on natural and cultural landscapes and therefore on the sustainable provision of ecosystem services within forests and pastures create several dynamics between the ecosystem and the social system. Especially extreme weather events such as the Vaia storm or other related climate change effects can have additional high impacts on the planned innovation developments and reinforced new innovation requirements such as adapted management, changes of innovation workshop organisation, stakeholder motivation and participation.

As highlighted previously, the issues derived from former policy decisions which favored industrial development as well as forest abandonment which determined forest recolonization and continued growth (monoculture) with several negative effects on the provision of FES, especially biodiversity and cultural landscapes.

These developments were later recognized by the future forest entrepreneur who had an ideal of a forest and pasture ecosystem in mind. The ideal was transformed in facts by the action of the policy entrepreneur, who had the ability to identify the right moment, namely the window of opportunity, to push the change, increasing the speed of restoration interventions, with consequent benefits in terms of FES provision. In this case, the policy entrepreneur was part of a provincial institution, well rooted and integrated in the local context. Acting from within the policy context could represent an advantage in terms of policy networks activation and influence on policy decisions.

Considering also the high inclination of the Forest Agency to build cross-regional networks and to create opportunities for dialogue. Moreover, the extensive structure of the Forest Agency, the local connections and relationships already in place, thanks to the social activity of the director of the forest district of Primiero, helped to collect and understand ideas, motives and concerns of the stakeholders and stimulate their proactivity and collaboration on the territory. Nevertheless, what is determinant for the effectiveness of the policy entrepreneur is the willingness to invest his resources (time, money, energy and reputation) in hope of a future return (Mintrom and Norman, 2009). To concretize a real change, the approval of a new law or the activation of a new fund are not sufficient. The policy entrepreneur has to further the cause with passion and devotion, additional elements, not obvious in public officers and policy makers, which make the difference to transform ideals into concrete actions.

Innovating the governance of FES is not simple, even for actors who have a traditional standing and relatively large influence in forest management, such as the Trentino Forest Agency. Confronted with a complex ownership situation, historical context, and external events that can only partly be anticipated, it takes considerable networking, communicating, and negotiating to eventually come to a common understanding of what direction FES governance should develop into. This is in line with previous research on socio-economic challenges of ecosystem service governance (Patterson and Coelho, 2009), including the diversity of the innovation ecosystem (Loft et al., 2015) and the impact of historical change in land-use change trajectories (Locatelli et al., 2017). The specific interplay of these aspects in the case presented here, seen through the lens of policy entrepreneurship, compelled the Forest Agency to act on multiple policy levels, i.e. provincial and local, and through various kinds of action, science advice to the provincial government and distinguishing itself as an intermediary for all FES-governance-related actors in the region. The specific complexities of the case show that actors interested in sustainable FES governance need to be versatile and skillful in interaction with policymakers and citizens alike to be able to actively promote system innovations. Similarly, the multi-disciplinarity of the ecosystem services concept requires knowledgeability in ecology, policy, politics, legal affairs, as well as cultural sensitivity, especially when dealing with a broad variety of stakeholders with diverse interests.

Very fruitful was the possibility to develop and analyse the innovation process of FES provision in the context of a larger project, which provides unique opportunities to compare other European regions and build networks to learn from other experiences and cases.

Indeed, although this research deals with a local case, this study may serve as a basis for further investigations in other regions, as in many areas the problems are quite similar and have also been identified in other studies (Maier et al., 2020) which recommended strengthening network approaches of local society in Czech Republic (Kluvankova et al., 2021), supporting small enterprises in local value chains in Austria (Loft et al., 2020) as well as in other mountainous regions within similar situations.

The study of opportunity windows makes this article especially valuable for possible practical applications. The importance of actors within the social and the ecological systems has been proved many times (Loft et al., 2020), but our approach focuses more on the important role of the policy entrepreneur on required actions in governance innovation processes. Important is that the demand for such innovations, which is increasing, and the supply of innovative ideas need to meet at some point, especially when it comes to planning, implementing, managing funding and financing such innovation actions.

7. Conclusion

In this case study we have shown the policy-entrepreneurial activity of the Forest Agency in the Primiero area of Trentino, Italy. We set out to understand the role of the Forest Agency in recent governance decisions and its efforts to contribute to a more multifunctional, integrated FES governance. We distinguished efforts made on the strategic governance level and the operational level. This distinction allowed for a differentiated view on what kinds of ecosystem services are addressed in what way. Furthermore, we looked at the activities in the three major categories of ecosystem services as well as cross-cutting issues to understand the structure of attention and shed light on the kinds of ecosystem services the Forest Agency is acting upon, thus answering our research questions.

We have found that in terms of FES governance emphasis is on cultural ecosystem services, while on the ground there is a robust monitoring system in place to follow the development of provisioning and regulating services of the Primiero forests. This differentiation between the governance and operational level is at first sight surprising, but it also shows how these kinds of ecosystem services are linked. Furthermore, it is plausible that the governance focus on cultural ecosystem services relates strongly to the major problems in the region (i.e., loss of cultural identity, depopulation) that can roughly be captured as social and institutional issues in part stemming from the region's history. Additionally, this strong focus on cultural ecosystem services indicates a conviction of the Forest Agency that forest ecosystems should be seen as socio-technical systems in which social, economic, and cultural aspects are inextricably interwoven with natural and ecological ones. In doing so, rather than attempting to bring back the lost traditional landscape, the Forest Agency tries to build on the experience and lessons of the past to shape a new managed and resilient landscape. The innovations the Forest Agency is stimulating with its dual approach of formal authority and informal participatory process are all geared towards this goal. Despite the intention to foster proactivity among the local stakeholders through consultation and workshops, arisen alternatives and recent governance decisions deal mostly with economic public support. Indeed, the results highlight that mountain agroforestry system management still needs to be stimulated and supported by public resources. In this regard, attention must be paid to break or reduce the dependence on public funds highlighted above and trigger a virtuous circle where the relaunching of traditional rural practices is able to maximize both habitat diversity, forage quality and productivity, and landscape attractiveness so that biodiversity, agriculture and tourism benefit from each other, sustaining economic development of mountain communities.

The case study also sheds light on a twofold theoretical contribution we make. First, Kingdon's Multiple Streams Approach was originally applied to the field of healthcare. Using it in connection with FES governance reveals different dynamics with regard to the actor structure and mechanisms involved. It highlights the role of agency and power relations through the Forest Agency, the policy entrepreneur. The Forest Agency has played a key role in formulating and advocating for politically and socially feasible alternatives through participatory processes in the existing forest governance. As several examples showed, a more inclusive strategy to formulate governance approaches that transfer the complexity of issues of forest ecosystems, their importance for local stakeholders and drivers of change to the governance "sector", requires an intermediary that can overview various developments (the three streams) and frame conditions as public problems become part of the governance agenda. A weakness of the MSA is the missing view on the framing process of problems by the policy entrepreneurs, as well as the processes/activities that convince decision makers to include the issues on the agenda and possibly as a governance. Second, more specifically, in socio-ecological research, the case study showed the strong importance of random problem windows in this domain as. When talking about innovation, the case study revealed that this is an additional task for stakeholders in FES governance. Once the random problem window of storm Vaia opened, the Forest Agency could for a while not invest in innovations looking into the future, but had to focus on the here and now as a result of an external event. The potential of involving stakeholders has by no means been exhausted. Here, too, a further learning process

will be necessary as to how one can stimulate and promote the emergence of bottom-up initiatives, and how one can grant the stakeholders real co-determination even with strong state participation (cf. Arnstein, 1969). This is also a question of participation capacity building.

The innovation strategy developed in Primiero by the Forest Agency proved to be effective to foster forest multifunctionality, especially because of the peculiar context which characterizes the Primiero area. A large social acceptance of the interventions and an increased awareness by local stakeholders favour long-term maintenance of agroforestry ecosystems and related economic business. The management system, however, could be further improved, as suggested by a set of alternatives identified through the participatory process. Stronger maintenance constraints, different funding and control systems, and specific guidelines are also afloat in the governance alternative soup. These could potentially jump onto the governmental agenda when measures are revisited for the next RDP funds 2021–2027.

In conclusion, independently from the initial background, the available financial resources and political decision-making, what is determinant to scatter a real change in the realm of FES management is the action of the policy entrepreneur, whose expertise, passion and motivation were, in some of the cases we analysed, crucial to bring laws and social debates to concrete results. We also find that efforts to initiate change should not be squeezed into too narrow a framework. First, one only learns in the course of the innovation work which limits have to be pushed. Second, such changes are not guaranteed within the time limits of a short project. Innovations take time to try out, take setbacks, find new alliances and starting points, and mature.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank Luigi Gottardo, director of the forest district of Primiero, for supporting us with technical information concerning forestry management and Primiero's background information; the whole staff of the Forest Agency of the Autonomous Province of Trento for sharing their knowledge and expertise on the strategy and actions implemented in the realm of forestry sector; Paolo Mori, head of Compagnia delle Foreste s.r.l., for moderating the cooperation process by encouraging the discussion and managing the different activities of the workshops.

Annex A

Stakeholder constellation of the governance innovation strategy in Primiero.

Stakeholder	Type[a]	Role[b]	Motivation
Artisanassociation: sawmills	PR	BU	Timber production as priority.
Association of breeders	PR	BU	Milk production and transformation (interest in pasture improvement and availability, as part of forest-pasture management).
Hunters association	PR	BE	Forest management due to its impact on hunting opportunities.
Hotel organization (hotels, restaurants, huts)	PR	BE	Concerned about landscape quality, an important factor of attraction for tourists.
Privatelandowners	PR	U/BE	Timber, climate regulation, aesthetic, biodiversity.
PU landowners (municipalities)	PU	U	Various interests, mostly economic. Seeking a balance between different services.
Natural Park Paneveggio	PU	MA	Biodiversity protection as priority. It has the power to influence forest management.
Forest Department	PU	MA	Forest management, function which is completely delegated to regions/autonomous provinces, always in respect to national and EU principles.
Local Agency for Tourism Promotion	PU/PR	BE	Aesthetic, cultural and spiritual value, recreation, biodiversity value.
Alpine Club and other associations	PR	BE	Aesthetic, cultural and spiritual value, recreation, biodiversity value.
Agronomist and forester association	PR	BU	Planning and forest management.

[a]Type of actor: public (PU), private (PR).
[b]Type of role in the innovation: business (BU), beneficiary (BE), user (U), manager (MA).

Annex B

Model of the semi-structured interviews to the stakeholders

1. Brief introduction (age, gender, education, tasks)
2. What do you think a forest pasture-system is?
   - A set of natural amenities
   - An economic resource
   - A historical-cultural heritage
   - A tool to promote a region/territory
3. Which challenges and opportunities does the management of forest-pasture systems present today?
4. Do you know other projects about concepts associated with the mountain environment (forest-pasture) and its values?
5. How do you perceive the management of the forest-pasture system? What is your level of satisfaction about the management performed by the Forest Department and the forest state property?
   - Do silvicultural practices have a significant effect on the environment?
   - Do pasture-related practices have a significant effect on the environment'
   - Is the amount of timber provided sufficient?
   - Is the extent of pasture land managed sufficient to ensure a good production?

- Are forests managed in a way that ensures a balance between production and other values?
- Does industry affect forest management?
- Do you think the current management of forest and pastures is generating unexpected and/or undesired effects?
- Do you think the management of the forest-pasture system has changed over the years?

6. Do you think something better could be made in the management of the forest-pasture system? If yes, what? How?
7. The Autonomous Province of Trento (PAT) guarantees the maintenance of a series of functions through the management of forest and pastures. Which one is the most important?
   - Maintain the composition diversity of the forest (low, medium, high)
   - Maintain the current levels in timber production
   - Create natural habitats
   - Protect water resources
   - Increase the stability of forests
   - Increase the extent of pasture areas
   - Ensure forest-based protection against avalanches, rock falling and floods
   - Other

1. What do you think is really innovative in the project we just presented to you?
2. Beyond PAT, do you think other stakeholders could promote innovation in this field? Which institutions or organizations?
3. How do you see your role in this context?
4. With which other stakeholders do you systematically collaborate on the management of the forest-pasture system? With which ones is the relationship difficult

Annex C

Full Kingdon's Multiple Streams Approach application to the FES governance innovation in Primiero (focus on the period 2014-2020)

Phases	1. Problem stream: **de facto problem recognition and issue mobilisation**	2. Policy stream: **de facto opening up and closing down the spectrum of alternatives**	3. Political stream: **de facto powering and taking opportunities**	4. Advocacy/ opportunistic **coalitions**; **power constellations**	5. **Windows of opportunity**
2014-2017	1.Loss of historical character of landscape values; 2. Loss biodiversity and habitats due to natural afforestation; 3. Loss of pastures and meadows and dependence on imported grass for cows breedings; 4.Lack of effective monitoring and control systems; 5.Loss of cultural identity and interest in rural activities by youth; 6.High dependence on public funds (rural activities revival and landscape preservation) and lack of overall vision by the local stakeholders; 7.Fragmentation of forest properties (impact on landscape management); 8.Naturalistic constraints, tourists, hunters interests are hindering factors for wood enterprises business; 9.Lack of recognition for FES provided by private forest owners (Regulating and provisioning FES); 10.Decreasing tourism attractiveness of the alpine landscape; 11.Excessive bureaucracy (hindering factor to private entrepreneurship, cause of delay of funds provision).	1-2-3. Restoration interventions in newly formed wood. 1-6. Economic sustain deforestation interventions by the use of resulting wood to support local biomass power stations. 7. Dialogue and direct contact lead by local foresters with forest owners to increase raising awareness and social acceptance on interventions for landscape preservation; new fiscal reform to cancel taxes on ownership transitions to favour aggregation of small rural properties and limit rent of parcels (strong limit for entrepreneurship → no long-term plans); stronger role of public institution: control location of properties to limit fragmentation in case of changes in road infrastructure and development urban plans by strong compensation scheme (North EU model). 5-10. Stronger integration of rural and tourism sectors (starting from already existing cases → hotel owners at the same time farmers, farmers managing agritourism).	1-2-3. RDP funds 2014-2020: actions for biodiversity conservation, landscape restoration and rural activities support; document of the Landscape Observatory in 2014; demonstrative project in Primiero in 2014; inclusion in the Landscape Fund 2016-18 of interventions for recovery of rural and mountain environment. 5-10. GreenWay Primiero Association from 2015 (promotes environmental conservation and sustainability, green economy, tourism). 7. Bank of the Land (Law 15/ 2015); provincial law on forestry associations in 2016 (private and public owners): addition of management plan as duty for legal recognition and funds disbursement).	1-2-3. PAT-FA-director of forest district in Primiero-private and public forest owners-breeders association 5-10. Municipalities, Natural Park Paneveggio, Agency for Tourism Promotion, local bank and enterprises 7.Public/private forest owners-PAT	1-2-3. **Opening WoO**: document of the Landscape Observatory 2014 paved the way to the demonstrative project in Primiero 2014, example for the following interventions across the region.
2017-2020		1-2. **Various alternatives** to improve the landscape restoration system: - maintenance enforced by a specific provincial law, defining stronger and longer maintenance constraints (10/	1-2-3. RDP funds 2014-2020; Landscape Fund 2016-18 → high social acceptability of this kind of interventions; EU project participation 2017-2020; provincial law June 2019 (LP n.2 11/06/19) → reactivation of	1-2-3. Forest Agency/ responsible for MFP/ EU project stakeholders 4. University-Forest Agency 5. PAT-internal institutions-E. Mach	1-2-3. **Opening WoO**: - Vaia 2018 → Action Plan (inclusion of the possibility to create new open areas where forests was destroyed);

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(*continued*)

Phases	1. Problem stream: **de facto problem recognition and issue mobilisation**	2. Policy stream: **de facto opening up and closing down the spectrum of alternatives**	3. Political stream: **de facto powering and taking opportunities**	4. Advocacy/ opportunistic **coalitions**; **power constellations**	5. **Windows of opportunity**
		20-year period, minimum 2 cuttings per year) and granting rewards if respected (targeted funds and control); - mapping and planning tools (e.g. Territorial Community Plan and Strategic Plan for the Landscape of Primiero); - guidelines for strategic management of interventions to: assure quality, economic sustainability, technical feasibility, identify clear public/private responsibilities, raising-awareness processes. 3. **Suitable method of mowing** to guarantee collection and re-use of hay: - building of a cooperative drying-system; - creation of new open areas to improve local forage production and increase the control of the production chain → high quality products. 4. **New protocol** for forest officers (more control, coordination with other provincial institutions); more accountability by the municipality, as public owner.5. **Various alternatives**: - targeted local development plans (school projects, farmers training, sustain bio-cultivation, smart-working, renovation of historical centers); - courses to raise awareness of environmental values and regional cultural heritage. 6. **Financing alternatives**: - new tourism-related taxes; - crowdfunding (run by Trentino Marketing and Agency for Tourism Promotion Primiero); - financial support of Agency for Tourism Promotion and local enterprise; - coordination and planning of actions among municipalities; - Raising-awareness process to increase private commitment to management and maintenance. 7.**Various alternatives**:- forest condominiums: several owners allow one forest operator to manage their properties;- forms of temporary occupation of private lands for public utility;- revival old "forest association" (among private and public owners), fostered especially by public administration;- compensation scheme, rewards for restoration interventions,	MFP by Forest Department. 4. New preliminary protocol approved and implemented in 2020; 5. Initiatives of social cheese factory of Primiero to involve youth (e.g. 2017 project on quality products, local tourism promotion); birth of breeders association of Primiero in 2017 (prosecution of the previous union born at the end of '70); States General of Mountain in 2019, participatory process promoted by PAT; Agriyoung → prosecution of SGM on young farmers issues; PL 2/2019 → integration of provincial law on agriculture (mentoring programs for new settlements of young farmers in agriculture/facilitate access and sustain to credit/facilitate and strengthen use of Bank of Land); multiannual program of Agric. Dep. for each point mentioned above → including in particular interconnection between MFP and Bank of the Land 7.National funding scheme 22/04/2020 (tackle fragmentation in mountain areas, promote active management of the territory and local peculiarities). 8.EU project workshops in 2019 as an opportunity to discuss and debate. 10. "Feeding tomorrow"(2016) → participatory process promoted by a PhD student, supported by the Province, on the topic breeding-food-tourism in Primiero; Provincial tourism reform (draft bill approved in August 2020) → new governance structure for tourism in Trentino, experiential tourism. 11.MFP reactivation in 2019: simplification of procedures for landscape recovery actions.	Foundation (school and research center)-municipalities social cheese factory-local hotel owners-breeders association 6.Trentino Marketing-PAT-enterprises Trentino Marketing-PAT-enterprises-hotelowners-municipalities 7.Public/private forest owners-PAT 8.Wood chain enterprises-municipalities-hunter association-PAT-Natural Park 10.University-PAT-hotel owners-breeders-social cheese factory, Slow Food 11. PAT-Forest Department	- 2020 technical group in Primiero (EU project interconnection); - next RDP funds (2021-27) **Closing WoO 2020**: - Covid-19 slowed down the approval process of MFP; - change of Head of Forest Department → again stagnation 6. **Opening WoO**: Vaia in 2018: activation of TreeAgreement in 2019 for reforestation, landscape restoration and raising-awareness 7.**Closing WoO:** Vaia in 2018: problem in governance agenda overcome by the emergency relating issues **Opening WoO**: PL 2/2019 interconnection between Bank of the Land and MFP

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(*continued*)

Phases	1. Problem stream: **de facto problem recognition and issue mobilisation**	2. Policy stream: **de facto opening up and closing down the spectrum of alternatives**	3. Political stream: **de facto powering and taking opportunities**	4. Advocacy/ opportunistic **coalitions**; **power constellations**	5. **Windows of opportunity**
		support of private owners by hotel owners.8. **More dialogue** among the parties involved;9. **Alternatives**: - compensation schemes;- from private/public owners to → large/small properties;- reintroduction of funds for private forest roads maintenance and creation;- option to rent private forests for hunting (similar to Austria system);- recognition of carbon sequestration service (CO2 certificates).10.**Alternatives:** - extend tourism season; - from mass tourism to niche tourism (environmental landscape, agricultural values) and application of ethics code; - improve thematic trails (contact with mid-elevation areas and *malga*) based on location and municipality; - new technology (e.g. augmented reality) where extreme events occured; - - malga restoration to create educational farms; - - new maps of rural landscape (see National Rural Network initiatives); 11. **Alternatives:** - - new effective instruments to transfer theory/law into concrete results; - - more flexibility in management and planning of the territory; - - less distance between policy and territory; - - to sustain wood chain businesses: same contract scheme for municipalities, multi annual auctions, collaboration between forest owners and firms.			

Abbreviations:

MFP – Mountain and Forestry Plan.
PAT – central government of the Autonomous Province of Trento.
PL – Provincial Law.
RDP – Rural Development Plan.
SGM – States General of Mountain.
WoO – Window of opportunity.

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