

Article

Contribution of Forest Stewardship Council Certification to Sustainable Forest Management of State Forests in Selected Southeast European Countries

Špela Pezdevšek Malovrh ^{1,*}, Dženan Bećirović ², Bruno Marić ², Jelena Nedeljković ³,
Stjepan Posavec ⁴, Nenad Petrović ³ and Mersudin Avdibegović ²

¹ Biotechnical Faculty, Department of Forestry and Renewable Forest Resources, University of Ljubljana, 1000 Ljubljana, Slovenia

² Faculty of Forestry, University of Sarajevo, Zagrebačka 20, 71 000 Sarajevo, Bosnia and Herzegovina

³ Faculty of Forestry, University of Belgrade, Kneza Višeslava 1, 11 030 Belgrade, Serbia

⁴ Faculty of Forestry, University of Zagreb, Svetošimunska 25, 10 000 Zagreb, Croatia

* Correspondence: spela.pezdevsek.malovrh@bf.uni-lj.si; Tel.: +386-1-320-3522

Received: 12 April 2019; Accepted: 24 July 2019; Published: 1 August 2019



Abstract: In recent decades, the concept of forest certification under the Forest Stewardship Council (FSC) has been widely adopted in selected Southeast European countries (Bosnia and Herzegovina, Croatia, Serbia, and Slovenia). As sustainability is traditionally recognised as a leading principle in the forest management doctrine in these countries, the aim of this study was to understand whether, and how, FSC forest certification contributes to the sustainable management of state forests. The research was carried out in two phases. First, in order to assess forest management compliance with FSC standard, non-conformities for the period 2014–2018, identified in audit Public Summary Reports, were analysed in all public companies that managed state-owned forests in selected countries. Further, in-depth, semi-structured interviews with the professionals responsible for forest certification in these companies were conducted ($n = 11$) to determine the contribution of forest certification to the economic, ecological, and social aspects of sustainable forest management. In total, 185 non-conformities were analysed. The results showed that FSC certification was successful in addressing certain problems in forest management practices and contributed to sustainable forest management, mainly covering social and ecological issues. The most frequently identified non-conformities were those related to FSC Principle 4 Community relations and worker's rights (32.3% of all non-conformities) and Principle 6 Environmental impact (30.4% of all non-conformities). The contribution of FSC certification to sustainable forest management is mainly reflected in the following aspects: Worker's rights; health and safety of employees; availability of appropriate personal protective equipment; consultation with local people and interest groups; awareness of environmental impacts of forestry operations; waste disposal and storage of fuel; improving the image of forest companies and maintenance of high-conservation-value forests. The majority of non-conformities were minor and required procedural changes to be closed. Moreover, there are no statistically significant differences between the countries with regard to the number of non-conformities for all principles. It can be concluded that FSC certification, as a market-driven mechanism, plays an important role by influencing forest management practices and business operations of public forest companies in a positive manner.

Keywords: forest certification; Forest Stewardship Council (FSC); sustainable forest management; public forest companies; non-conformities; Southeast European countries

1. Introduction

Sustainable forest management (SFM) is the central concept in the management of forests across European countries [1,2] and plays a significant role in European bio-economy policies [3]. The concept of SFM was originally developed at the Rio Earth Summit in 1992, where the non-legally binding Forest Principles initiated environmentally appropriate, socially beneficial, and economically viable management of the world's forests [4]. Thus, SFM certification was introduced in the early 1990s as a voluntary mechanism, to alleviate the consequences of deforestation and forest degradation and to promote the maintenance of biological diversity, especially in the tropics [4]. Forest management (FM) certification was widely accepted all around the world as an innovative policy instrument for operationalizing the concept of SFM [1,5], and has directly influenced FM practices and forest conservation [6–10].

Various voluntary FM certification schemes, standards, and guidelines are operating at different levels, many of which are designed for national or local use (i.e., Canadian Standards Association, Malaysian Timber Certification Scheme, Sustainable Forestry Initiative) [5], where the Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification (PEFC) are the two most prominent international private schemes [1,5,11]. These schemes contribute to common standardization, to a degree, by setting internationally recognized sets of FM principles and criteria [12].

FSC is one of the most influential forest certification schemes implemented in many Southeast European countries (SEE). Most of the FSC certified areas in selected SEE countries (Bosnia and Herzegovina (BiH), Croatia, Serbia and Slovenia) are state-owned forests, managed by public forest companies; whereas the implementation of FSC certification in private forests is marginal (11.3% in Slovenia and 1.2% in Croatia). Public companies that manage state forests updated their FM practice and operations to comply with the requirements of FSC standards. This is quite a demanding task as FSC FM certification is based on 10 principles and 56 criteria that need to be verified by external audit [13].

Several studies analysed FSC's advantages and success or limitations and barriers [14–17], legitimacy [18], forest governance improvements [12,19,20], accountability [21], effectiveness [22], as well as consumers and private forest owners' perceptions and demands [7,23–25]. Moreover, studies have also analysed the reasons why forest companies are changing their practices to comply with FSC standards [7] and investigated the reasons for selecting a particular forest certification scheme [26]. However, others have focused on the impacts of FSC forest certification on FM [27], business performance [9,20,27–31] and ecosystem services [32–34] or studied the differences in FM practices between certified and non-certified forests [35]. By examining the impacts of FSC on FM through the results of certification audits, several international studies provided a detailed analysis of the corrective action requests (CARs) found in audit reports as CARs are an indicator for assessing changes in forest management practices [8,12,14,30,36–39]. These studies showed that improvements in FM practice due to the FSC certification are likely to occur [4] and that a wide variety of improvements exist between regions, mostly due to different FM regimes and ownership patterns [40]. In a comparative study across Europe regarding FSC certification, Rametsteiner and Simula [4] reported that areas of improvement are most likely related to the FM process of companies, especially in planning and monitoring. In almost half of the assessments, CARs-concerned management planning placed more emphasis on the existence and accuracy of documents in forest management. The other issues requiring further action were social relations (community relations and worker's rights) and ecological improvements. Moreover, a study carried out by World Wildlife Fund (WWF) showed that half of the CARs in the European countries analysed (Estonia, Germany, Latvia, Russia, Sweden and the UK) were raised to cover ecological issues, followed by social and economic issues, which were equally distributed [41]. The study of Hain and Ahas [42] compared the occurrence of FSC FM non-conformities between Eastern and Western Europe and discovered that compliance with legislation was more challenging in Eastern Europe. The larger share of non-conformities in Eastern Europe refers to

forest harvesting, rare and endangered species, environmental impact assessment and worker's safety requirements. Furthermore, the study of Buliga and Nichiforel confirmed that, in Romania, compliance with legislation is the biggest problem [5].

In selected SEE countries, studies focusing on forest certification at the national and regional level are still in the initial phase. These studies range from the implementation of FSC on the ground [43–50] to analysis of the relationships between different stakeholders [45,51]. However, the obstacles at the FM level and particularly, the effects of forest certification on SFM remain rather unclear as only a few studies have analysed non-compliance of FM activities with FSC Principles and identified CARs. For example, Halalisan et al., Avdibegović et al. and Janež [14,52,53] found that in BiH and Slovenia, most CARs related to FM in state forests were minor, where environmental and social impacts predominated. Moreover, Janež [53] found that the number of CARs decreased over time (from the first certification to the re-certification period). The study of Popović [54] found that the majority of CARs related to FM in Croatian state forests are those dealing with environmental impacts, community relations, worker's rights, and maintenance of high conservation value forests (HCVF). In addition, the study of Velojić et al. [55] also analysed CARs for certification and re-certification periods in the public forest company, Vojvodinašume. In this study, it was found that the number of CARs decreased from the first certification period to the re-certification period. The highest shares of CARs in both certification periods were those referring to Principle 6 Environmental impact, followed by Principle 4 Community relations and worker's rights and 7 Management plan. Additionally, these studies showed some improvement in SFM practices, such as increasing transparency, the development of internal guidelines and work instructions, building close relations with other stakeholders, improving methods and technologies of FM, establishing HCVF, and the protection of specific natural values.

Although some studies have begun to explore the effects of certification and improvements in SFM in selected SEE countries, these do not investigate all aspects related to SFM practices in state forests, especially not the view of professionals responsible for the forest certification process in public forest companies. Following that, this study tried to compensate for the lack of similar studies in SEE countries. The purpose of this study was to analyze the impacts of FSC certification to SFM practices of public forest companies in SEE countries. For that purpose, the FSC principles and criteria, Version 4.0 [56] were used to study the non-conformities identified by audit reports and related CARs. By doing so, specific and valuable information about how forest certification is influencing SFM practice in the field were provided. From a methodical point of view, the regional approach provides a good context for the research in selected SEE countries. The region is geographically compact but the selected countries, although they had a similar political context during socialism, have been characterized by different political and economic developments after the breaking up of Yugoslavia. These differences influenced the forest sector and made the cross-country comparison related to the contribution of FSC certification to SFM interesting. The results of this study are useful for understanding the improvements that are required in SFM practices in selected SEE countries, and are likely to be relevant for policy makers interested in general topics of forest governance, and more specifically, those who are interested in the promotion and implementation of voluntary forest certification.

2. Background on Certification in Selected SEE Countries

In selected SEE countries, forests are important natural sources that are valuable from both economical and socio-ecological points of view. The implementation of forest certification in selected SEE countries has grown in importance in recent decades, mainly due to the following three reasons: (a) the willingness of public forest companies to improve their business performances and competitiveness, with an ultimate goal to achieve SFM; (b) the growing interest from civilian society, media and non-government organizations (NGOs) in becoming actively involved in addressing the issue of SFM and illegal practices in the forest sector; (c) the interest of forest and wood-processing companies in assuring their international customers of the legality and sustainability of their timber supply chains.

In Slovenia, forests cover 58.2% of the inland territory with approximately 6 million m³ harvested annually since 2014 [57]. Forest certification efforts in Slovenia began in 2007, when the Farmland and Forest Fund of the Republic of Slovenia obtained FSC certification for all state forests. The FSC-certified forest area increased after 2010, when the Farmland and Forest Fund of the Republic of Slovenia expanded the certification process to the private forests. As of March 2019, two FM certificates are in place in Slovenia, covering 22.3% of Slovenian forests (Table 1). From this area, 233,106.28 hectares are state properties managed by the public forest company, Slovenski državni gozdovi, and 29,582.62 hectares are grouped certified by eight private forest owners [58]. As in Slovenia, small private forest properties prevail and the PEFC certification system also exists. Moreover, in 2017, the public forest company also obtained PEFC certification as it met the requirements of the wood processing industry.

In Croatia, forests cover 48.7% of the inland territory. The majority of state-owned forests are managed by the public forest company, Hrvatske šume, which harvests around 5.5 million m³ annually. These forests were FSC certified in 2002 [59]. Some private forest owners, who emerged from the process of restitution, obtained FSC certificates in the year 2013. As of March 2019, four FM certificates are in place in Croatia, covering 74.3% of Croatian forests. From this area, 2,024,460.62 hectares are state properties managed by the public forest company, Hrvatske šume (Table 1) [58].

In Serbia, forests cover 29.1% of the territory. The majority of state forests are managed by two public forest companies, Srbijašume and Vojvodinašume. State forests managed by the public forest company, Srbijašume were partly FSC certified in 2009 (six forest management units), and the process of certification was completed in 2012, when the remaining 11 forest management units were FSC certified. State forests managed by the public forest company, Vojvodina šume were FSC certified in 2008. Therefore, three FM certificates are in place in Serbia, covering 45.3% of Serbian forests (Table 1). From this area, 890,665 hectares are managed by the public forest company, Srbijašume and 130,589 hectares by the public forest company, Vojvodinašume [58]. These two companies annually harvest approximately 2.7 million m³ [60,61].

In BiH, forests cover 56.7% of the inland territory [62]. BiH consists of two entities (Federation of Bosnia and Herzegovina (FBiH) and the Republic of Srpska (RS)) and the Brčko District. In FBiH, 1,518,471 hectares of forests are state owned, with approximately 2.5 million m³ harvested annually [63]. In RS, state forests cover 1,094,834 hectares, in which approximately 2.0 million m³ are harvested annually [64]. State-owned forests are managed by public forest companies, cantonal forest companies (one in each canton) in FBiH, and Šume Republike Srpske in RS [65]. All certified forests in BiH are state-owned and certified by the FSC (Table 1). The process of FSC certification started in 2005 and at this time (March 2019), seven public forest companies have FM certificates [58] (Table 2).

Table 1. Basic information about certified forest areas.

Country	Forest Area (ha)	Total Forest Area Certified by FSC (ha) [66]	Forest Area Certified by FSC (%)	State-Owned Forests Certified by FSC (%)
BiH	2,904,600	1,768,071	60.9	76.0
Croatia	2,759,039	2,048,592	75.4	98.8
Serbia	2,252,400	1,021,254	45.3	85.5
Slovenia	1,180,281	262,688.9	22.3	100.0

Table 2. List of valid Forest Stewardship Council (FSC) certificates.

Country	Company	Certificate Data	Re-Certification (N°)	Code
BiH	Unsko-sanske šume	First issue date: 2010, last issue date: 2015	Yes (1)	BiH1
	Srednjobosanske šume	First issue date: 2016	No	BiH2
		First issue date: 2019	No	BiH2
	Hercegbosanske šume	First issue date: 2012, last issue date: 2017	Yes (1)	BiH3
	Šume Tuzlanskog kantona	First issue date: 2011, last issue date: 2016	Yes (1)	BiH4
	Sarajevo šume	First issue date: 2018	No	BiH5
	Šumsko privredno društvo Zeničko Dobojskog kantona	First issue date: 2018	No	BiH6
Šume Republike Srpske	First issue date: 2008, last issue date 2018	Yes (2)	BiH7	
Croatia	Hrvatske šume	First issue date: 2002, last issue date: 2017	Yes (3)	CRO8
Serbia	Srbijašume	First issue date: 2009, last issue date: 2014	Yes (1)	SER9
		First issue date: 2011, last issue date: 2017	Yes (1)	SER9
	Vojvodinašume	First issue date: 2008, last issue date: 2018	Yes (2)	SER10
Slovenia	Slovenski državni gozdovi	First issue date: 2007, last issue date: 2017	Yes (2)	SLO11

To date, all four selected SEE countries have no national FSC standards in place. Although the establishment of a standard development group and the drafting of national FSC standards is ongoing in some countries, forest certification is still conducted in line with generic standards used by certification bodies and adapted to the national context.

3. Materials and Methods

The methodological approach in this study is based on a triangulation of quantitative and qualitative methods [67]. Therefore, in the first phase, the non-conformities (CARs) in the official audit Public Summary Reports (available on the FSC Public Search website (FSC is constantly evolving; therefore, the list of 10 FSC Principles was updated in 2018. However, when this study was conducted, public forest companies in selected SEE countries were audited according to the former set of FSC principles) [58]) issued by third-party certifiers accredited by FSC were analysed for the time period 2014–2018. The sample consisted of all valid FM certificates for public forest companies in selected SEE countries (BiH, Croatia, Serbia and Slovenia). This search led to a list of 13 valid FSC certificates (Table 2).

The data from 24 audit Public Summary Reports were systematically organized by country and company in the Microsoft Excel software. The number and severity (major, minor and observation) of FM non-conformities with FSC Principles (Table 3) were recorded in the database. The data were analysed by using the statistical analysis software SPSS 20 [68].

Table 3. The ten FSC Principles ^{A,B}.

FSC Principle	Description
1—Compliance with laws and FSC Principles	Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.
2—Tenure and use rights and responsibilities	Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.
3—Indigenous peoples' rights	The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.
4—Community relations and worker's rights	Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.
5—Benefits from the forest	Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.
6—Environmental impact	Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest
7—Management plan	A management plan—appropriate to the scale and intensity of the operations—shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.
8—Monitoring and assessment	Monitoring shall be conducted—appropriate to the scale and intensity of forest management—to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.
9—Maintenance of high conservation value forests	Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.
10—Plantations	Plantations shall be planned and managed in accordance with Principles and Criteria 1–9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

^A: Principle 3 is not applicable in selected SEE countries since no indigenous peoples are present.

^B: No non-conformities were issued for Principle 10, concerning plantation, as this principle is considered in Public Summary Reports not to be applicable in selected SEE countries since plantations are not part of regular forest management practice.

The collected data were firstly analysed in tables, figures and simple descriptive statistics. For further analysis of the potential variables that might be associated with numbers of issued non-conformities, this study also ran inferential statistical tests. Given the non-parametric nature of

the collected data, a Mann–Whitney U test or Kruskal–Wallis test was used to determine the differences in the distribution of non-conformities by FSC Principles. In particular, the differences were identified between the status of countries regarding the EU integration process and the certification status of forest companies. For that purpose, countries were grouped into categories: EU member countries (Croatia and Slovenia) and EU candidate countries (BiH and Serbia), while forest companies were also classified into two categories: First-time certificated and re-certificated. The differences were considered statistically significant at $p < 0.05$.

In the second phase, in order to gain insight into the effects of certification on SFM, semi-structured face-to-face interviews, consisting of closed-ended (a five-point Likert scale was used to measure contribution, where 1 corresponded to very low contribution, the mid-point 3 was neither low nor high contribution and 5 corresponded to a very high contribution) and open-ended questions, were conducted with responsible professionals (heads of internal forest certification teams in FSC-certified public forest companies) in selected SEE countries. The interview protocol consisted of three thematic sections, focusing on the overall contribution of FSC certification to SFM, the fulfilment of criteria related to FSC Principles and effects of FSC certification on several economical, ecological and social aspects of FM. In total, 11 interviews were conducted in March 2019 in selected SEE countries (Table 4). The interviews were conducted in the countries' native language and later translated and transcribed into English. The data collected through interviews were analysed through content analysis following Krippendorff [69] using codes and their sub-codes with the support of MAXQDA 2018 software [70]. Additionally, a statistical analysis (descriptive statistics) was performed on the data collected with closed-ended questions on a five-point Likert scale.

Table 4. The number of interviewees by countries.

Country	N° of Interviews
BiH	7
Croatia	1
Serbia	2
Slovenia	1
Total	11

N°: Number.

4. Results and Discussions

4.1. Distribution of Non-Conformities

A total of 185 non-conformities in relation to the FSC standard requirements were identified for the period of 2014–2018 in public forest companies within selected SEE countries. Non-conformities correspond to the information recorded in 24 official audit Public Summary Reports, of which the highest number was issued in BiH, followed by Serbia, Croatia and Slovenia (Table 5). This distribution is affected by the number of analysed public forest companies per countries (see Table 2).

Table 5. The number and distribution of non-conformities by countries.

Country	N° of Non-Conformities	% of Total
BiH	114	61.6
Croatia	17	9.2
Serbia	43	23.2
Slovenia	11	5.9
Total	185	100

N°: Number.

The highest shares of identified non-conformities in selected SEE countries were found for Principle 4 (32.4%), concerning community relation and worker’s rights, followed by Principle 6, which dealt with the environmental impact (30.3%). Together, these two principles covered 62.7% of all identified non-conformities, confirming the results of previous studies [4,12,14,36,37,71,72]. In these studies, the authors argued that environmental and social issues were more difficult to comply with than the economic ones. When considered together, these studies suggest that, already there is a relevant body of empirical evidence indicating that Principle 4 and 6 are particularly challenging in the FSC system regardless of the geographical area and certificate type [12]. Furthermore, Principle 8, related to monitoring and assessment, had a share of 15.7% of the identified non-conformities, whereas, for all other Principles, the share of non-conformities ranged between 8.6–2.2% of the total (Figure 1).

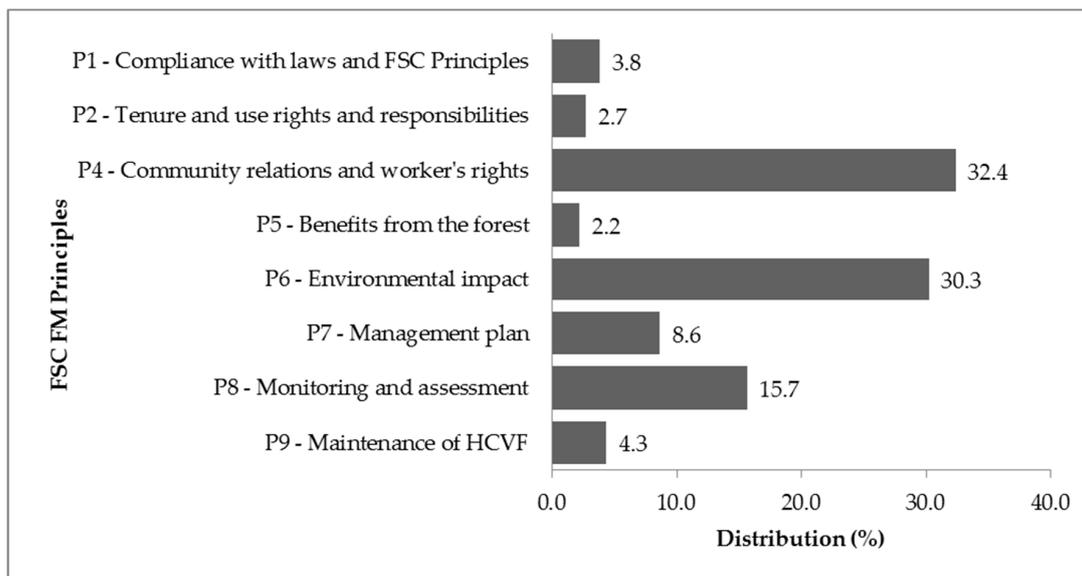


Figure 1. The distribution of non-conformities by FSC principles.

To further understand the specific issues to which non-conformities relate, the descriptions of non-conformities were analysed in detail for two of the most important principles in the selected SEE countries—Principle 4 and Principle 6 (Figures 2 and 3).

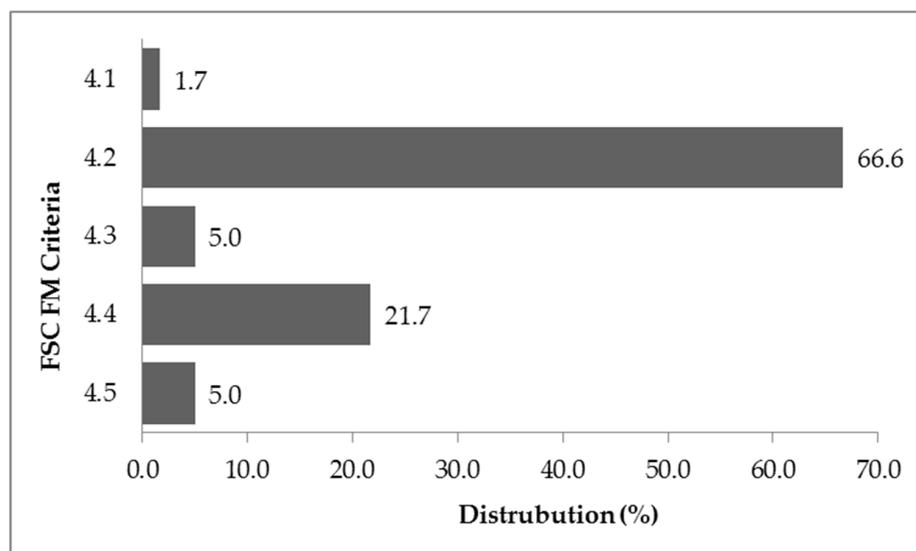


Figure 2. The distribution of criteria related to Principle 4.

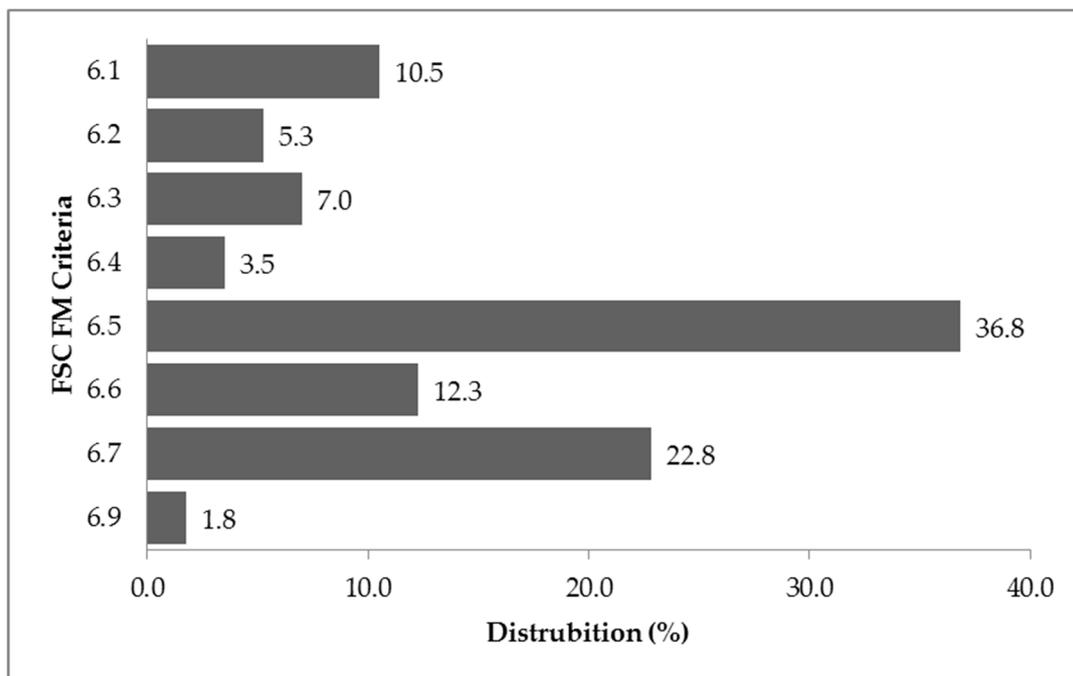


Figure 3. The distribution of criteria related to Principle 6.

In the case of Principle 4, most of the non-conformities (66.6%) referred to Criterion 4.2, indicating that FM should meet or exceed all applicable laws/regulations covering the health and safety of employees and their families. A deeper analysis indicates that the majority of the non-conformities refer to the availability of appropriate personal protective equipment (PPE) at the worksite, compliance with the International Labour Organization Code of Practice on Safety and Health in Forestry, as well as established emergency procedures and key responsibilities related to the identified risks. In addition, frequent non-conformity has also been identified in relation to Criterion 4.4, dealing with lack of consultation with local people and interest groups, particularly with forest workers about working conditions and with contractors on the implications of the SFM procedures (21.7%). Concerning this criterion, there is also the issue of the need to incorporate the results of the evaluations of the social impacts in FM planning and operations. Some of the companies are missing an up-to-date list of stakeholders, as well as continuous cooperation with relevant stakeholders in terms of road construction or identification of special interest sites. Other criteria were less important as the distribution of non-conformities which ranges from 5.0% to 1.7%.

The identified non-conformities related to Principle 6 are distributed among several criteria (Figure 3). The certification process obliged companies to be more aware of the environmental impacts of forestry operations that were often neglected. The identified non-conformities frequently relate to the absence of written guidelines for environmental impact assessment (criterion 6.5; 36.8%). However, the use of these guidelines is not appropriately integrated into the day-to-day planning process, while in most cases, the results of the assessments are mainly descriptive without any real evaluation of the impacts. Apart from this, non-conformities often refer to waste disposal (criterion 6.7; 22.8%), particularly inadequate on-site management and storage of fuel, as well as the use of chemical pesticides (criterion 6.6; 12.3%).

These results reflect several aspects of state-owned FM practice. Although existing legislation clearly prescribes working conditions and worker's rights, there are some deviations on-site. As harvesting activities in selected countries are often performed by contractors (usually small and medium private companies), public forest companies have no direct management control over forest workers. Due to this, for the most identified non-conformities related to Principle 4, companies have limited legal and personal capacities to control or sanction the harvesting of contractors, except

for reporting them to the responsible inspection service. This is due to the lack of concern regarding reducing the socio-environmental impact of logging activities [73,74]. Therefore, it is important to establish clear internal procedures that enforce contractors to possess and use PPE (e.g., one of the requirements in public procurement procedures), develop and implement training for forestry workers and enrol promotional activities aimed at raising the awareness of PPE. As certification implies, the independent assessment of performances by a third-party auditor, where certain issues regarding partiality associated with internal control are mitigated, it seems that FSC certification contributed to these aspects of SFM in selected countries.

The situation is also similar when it comes to the identified environmental issues related to Principle 6, i.e., the use of pesticides, waste and disposal management, for which capacities for monitoring and controlling are somehow limited by public forest companies. The same findings were confirmed in Romania [5]. Waste and chemical disposal management are identified as a problem due to the low level of awareness of contracted forestry workers and companies' employees on the negative environmental impacts. It is important to improve awareness and to establish internal procedures that would enforce appropriate utilisation of waste disposal equipment on-site. The usage of forest machinery, that is, on average, quite old and in poor condition, also cannot be neglected. Since the majority of non-conformities identified in selected countries were associated with the harvesting contractors, these findings highlighted important failures in public forest companies' internal control and monitoring system. Public forest companies have to apply more effective internal controlling systems and develop technical guidance and procedures for improving companies and contractors relations in order to mitigate environmental impacts. Additionally, the policy and institutional set up should focus more on finding alternative instruments that foster the implementation of harvesting operations which reduce the environmental and social impact. As Giessen et al. argued, state actors can play an important role in forest certification governance [19].

The presented findings are in line with the results of Hain and Ahas [42], where the majority of non-conformities identified in Eastern Europe compared to Western Europe refer to forest harvesting, environmental issues and worker's safety requirements, clearly showing the importance of the development level in forestry practice of each specific country. Similar findings are presented in studies focusing on SEE regions where identified non-conformities most frequently correspond to Principles 6, 4 and 8 [14,53–55].

The number and distribution of non-conformities by FSC Principles and countries are presented in Table 6. In Croatia, 41.2% of the non-conformities refer to Principle 6, while in Serbia, Slovenia and BiH, they account for 39.5%, 27.3% and 25.4%, respectively. In BiH, 38.6% of the non-conformities refer to Principle 4, while in Slovenia, Croatia and Serbia, they account for 27.3%, 23.5% and 20.9%, respectively.

Table 6. The number and distribution of non-conformities by FSC principles and countries.

Principle	Country			
	BiH—N° (%)	Croatia—N° (%)	Serbia—N° (%)	Slovenia—N° (%)
Principle 1	2 (1.8)	2 (11.8)	3 (7.0)	0 (0.0)
Principle 2	2 (1.8)	0 (0.0)	1 (2.3)	2 (18.2)
Principle 4	44 (38.6)	4 (23.5)	9 (20.9)	3 (27.3)
Principle 5	2 (1.8)	0 (0.0)	2 (4.7)	0 (0.0)
Principle 6	29 (25.4)	7 (41.2)	17 (39.5)	3 (27.3)
Principle 7	10 (8.8)	1 (5.9)	4 (9.3)	1 (9.1)
Principle 8	21 (18.4)	1 (5.9)	6 (14.0)	1 (9.1)
Principle 9	4 (3.5)	2 (11.8)	1 (2.3)	1 (9.1)

N°: Number.

Upon testing the differences in the distribution of non-conformities by FSC Principles related to the countries, their integration status to the EU (member countries or candidate countries) and forest

companies certification status (first time certificated or re-certificated), it can be noticed that there are only a few statistically significant differences.

The Kruskal-Wallis test showed that there were no statistically significant differences between the countries related to the number of non-conformities for all the principles (Table A1 in Appendix A). Moreover, the statistically significant differences in the number of non-conformities as a result of EU integration status were also tested for all the FSC Principles. Regarding this, the Mann–Whitney U test showed that there were no statistically significant differences between the EU countries (Slovenia, Croatia) and EU candidate countries (Serbia and BiH) (Table A3 in Appendix A). This shows that EU integration status has no influence on the number of non-conformities for all the principles. The results are not surprising as in other studies it was indicated that the distribution of non-conformities was the same at the regional scale [8,12,36,41]. Although membership of the EU requires respecting certain legal regulations regarding the management and protection of natural resources (e.g., Natura 2000), the fact is that forest certification is a voluntary-based mechanism. Therefore, its implementation is not a requirement of EU membership. A variety of ecological and market-driven factors influence forest management realities. Thus, EU membership status does not solely influence the number of non-conformities for FSC Principles.

In addition, the Mann-Whitney U test was used to identify the differences between companies that were first-time certificated and those that were re-certificated in terms of the number of non-conformities. The results showed that statistically significant differences between the first-time certified and re-certified forest companies existed for Principle 4 ($U = 1.000$, $z = -2.708$, $p = 0.007$) and Principle 6 ($U = 4.500$, $z = -1.967$, $p = 0.049$). Within the analysed period, re-certified companies have, on average, more non-conformities than those who are first-time certified in relation to both the mentioned principles (Table A2 in Appendix A). Different results were found in other studies, e.g., in the case of Brasilia, the audit type did not influence the occurrence of non-conformities [12], or in case of Serbia, where the number of non-conformities decreased from the first certification period to the re-certification period [55].

Based on this, it can be concluded that FSC certification in selected SEE countries represents a continuous process of improvements in forest companies' performances. In that context, further developments of forest certification and its contribution to SFM can be analysed from the perspective of adopting national FSC standards in selected SEE countries. Further, there can be improvement in the overall credibility of the process, once the certification is based on national and not generic FSC standards.

4.2. Categorization of Non-Conformities per Meta-Categories

To enable a comparison with the findings of similar studies worldwide [5,37,39,75] and to provide a deeper analysis of the type of non-conformities observed, they were categorized into four meta-categories (forest management issues, social issues, environmental issues and economic/legal issues) (Figure 4). The meta-categories were then subdivided into issue categories, following the procedure of Blackman et al. [39,75].

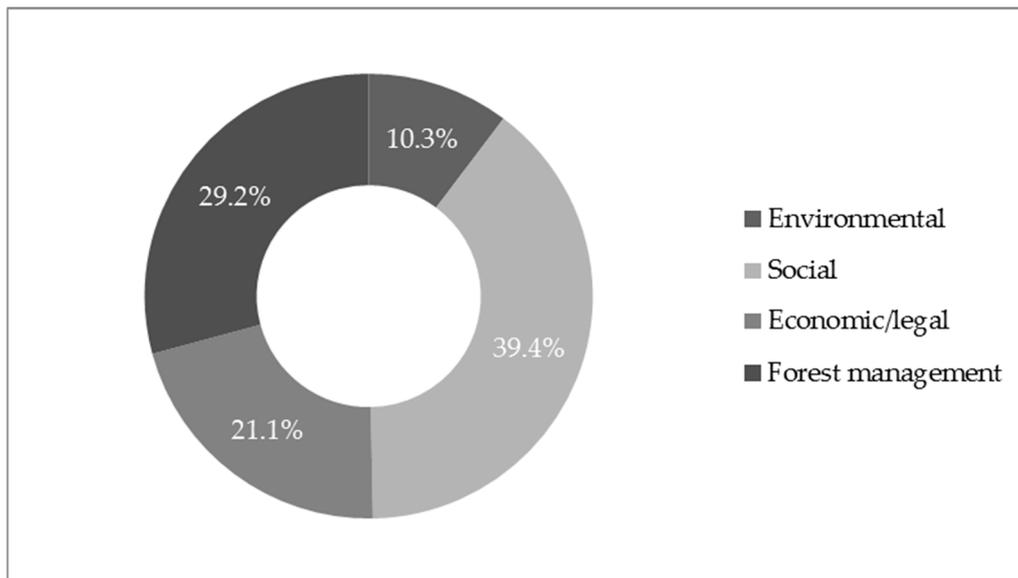


Figure 4. The distribution of non-conformities by meta-categories.

In selected SEE countries, most non-conformities (73) fall into the social meta-category (39.4% of the total), mostly related to health and safety at work and communication and conflict resolution. The forest management meta-category integrates 54 non-conformities (29.2% of the total), which are mainly related to the regeneration/reforestation or chemical use and disposal. The economic/legal meta-category brings together 39 non-conformities (21.1% of the total) that refer to management profitability and other legal requirements, in addition to the implementation of the voluntary procedures specific to FSC certification. The environmental meta-category groups 19 non-conformities (10.3% of the total) mainly related to sensitive sites and HCVF. A detailed categorization of non-conformities per meta-categories and issues per countries is presented in Table A4 in Appendix A. From the table, it can be seen that in BiH and Slovenia, most of the non-conformities fall into the social meta-category (44.7% in BiH and 45.5% in Slovenia), while in Serbia and Croatia most of the non-conformities fall into the forest management meta-category (41.9% in Serbia and 41.3% in Croatia). These results are in line with previous studies, where most of the non-conformities also fall in the social meta-category [36,37,39,75]. As an interpretation of this result, Newsom and Hewitt suggested that companies often struggle to comply with requirements for worker safety and are often involved in conflicts with different stakeholders [36].

4.3. Severity of Non-Conformities

According to the severity (scale and intensity) of identified non-conformities, they are classified as either major, minor or observation [76]. From the total number of non-conformities issued to public forest companies, the vast majority were minor and required procedural changes to be closed (71.4%). However, if minor CARs are not closed within the given deadline, they may shift into the classification of major CARs. A total of 7.5% of non-conformities were identified as major ones, while 21.1% were classified as observations (Figure 5).

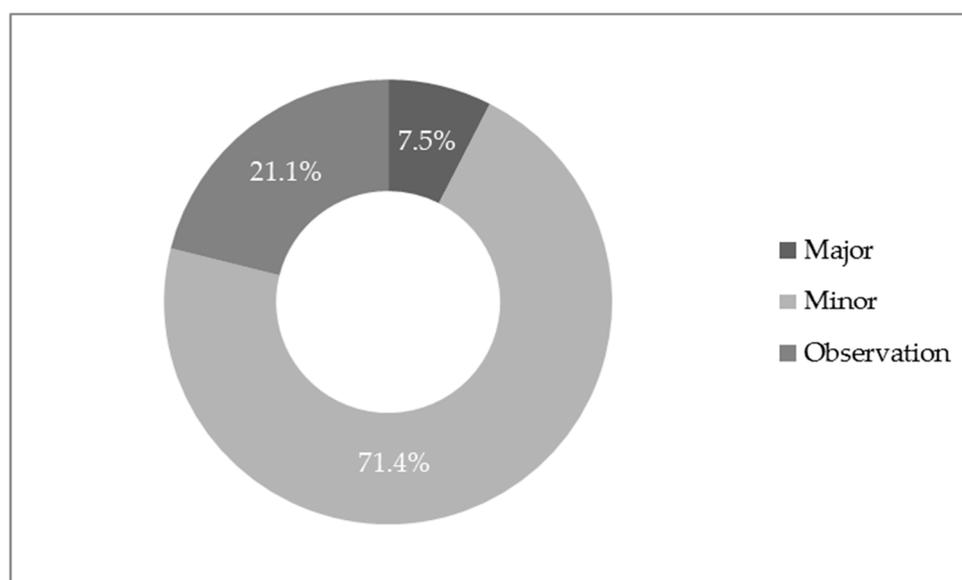


Figure 5. The number and distribution of non-conformities by severity.

Although FSC certification has the potential to contribute to SFM in selected SEE countries, it is important to underline that the majority of identified non-conformities were minor ones, requiring mainly procedural changes to be closed within a certain deadline. In BiH, Croatia and Serbia, some major non-conformities were identified, while observations were identified in all the selected countries (Table 7). The same findings were found worldwide [14,37,39,77]. In these studies, a clear predominance of minor non-conformities that required only procedural changes to be closed was reported, suggesting that non-conformities tend to be a result of occasional, non-systematic errors in the standards required by the principles and criteria.

Table 7. The number and distribution of non-conformities by severity and countries.

Severity of Non-Conformities	Country			
	BiH—N° (%)	Croatia—N° (%)	Serbia—N° (%)	Slovenia—N° (%)
Major	9 (7.9)	4 (23.5)	1 (2.3)	0 (0.0)
Minor	81 (71.1)	10 (58.8)	33 (76.7)	8 (72.7)
Observation	24 (21.1)	3 (17.6)	9 (20.9)	3 (27.3)

N°: Number.

4.4. Professionals' Opinion on Implementation of FSC FM PRINCIPLES and Contribution to SFM

The professionals responsible for certification in the public forest companies indicated the contribution of FSC FM Principles to SFM on a five-point Likert scale (Figure 6). The contribution of FSC FM Principles to SFM was evaluated as high or very high by 9 out of 11 of the interviewees (average value 4.0).

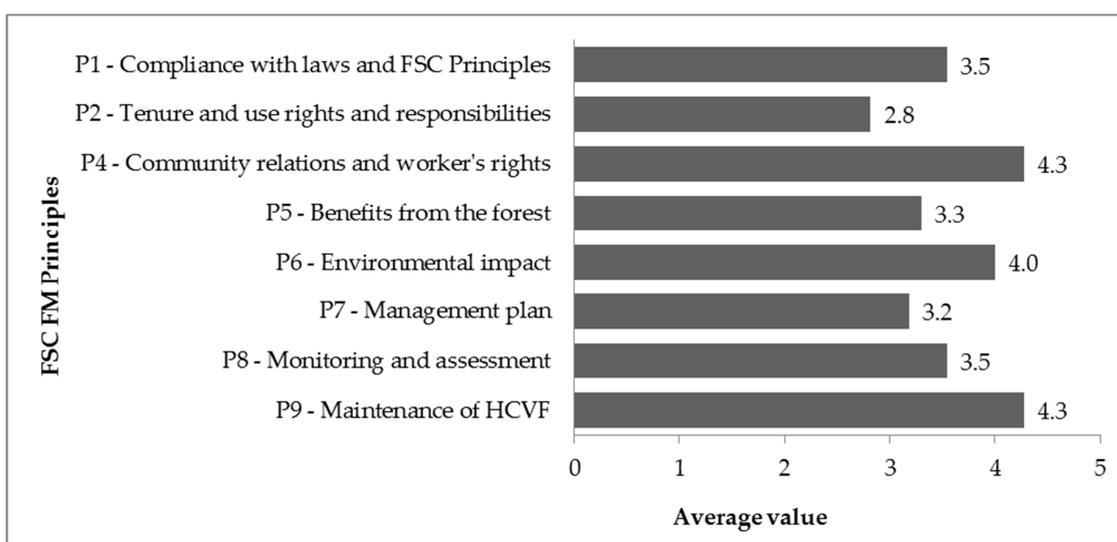


Figure 6. The average values of FSC principles contribution to SFM.

The results from the interviews showed that Principle 4 (average value 4.3), Principle 9 (average value 4.3) and Principle 6 (average value 4.0) were considered by professionals to contribute the most to SFM.

It was indicated that, in most cases, certification improved the social performance of companies (Principle 4). With regard to worker's rights and well-being, all interviewees stated that certification helped companies to ensure their compliance with laws and regulations, covering the health and safety of employees and improved working conditions. This is reflected in the following statements: *"The worker's rights are respected, workers are now voluntarily organized and they receive regular salaries with all supplements and PPE [BiH1] and The evidence of social responsibility of company reflects in insisting on respecting the laws by private contractors with the aim to secure health and safety of employees"* [SER10]. On the other hand, these improvements seem to be relatively slow, as noted by some interviewees, i.e., *"Implementation of Principle 4 is very slow so harmonization of legislation with internal rules should be faster"* [BiH4] or *"... we started to harmonize PPE rules with ILO convention and it takes time ... now employees have appropriate PPE"* [BiH6]. The results of interviews demonstrated that certification had a positive impact on worker's rights and working conditions. These results are only partially in line with similar studies, where the lack of general agreement on the positive social impact of certification is underlined [10,28]. The progress of social performances of companies driven by certification is reflected the improvement of the relationship between companies and stakeholders. This is clearly shown in the statement: *"Relations with local communities were at low level before obtaining FSC certificate ... nowadays cooperation is raised to a higher level"* [BiH1]. Interviewees also believe that local communities benefit from the implementation of FSC certification in several ways: *"... through opportunities for employment and engagement in occasional jobs"* [BiH4], assistance of a public forest company in solving certain problems (e.g., the organization of certain events, maintenance of local roads, etc.) [BiH1], afforestation [BiH6] and education of people [BiH6], as well as different types of consultations [BiH3, BiH6, CRO8, SER9]. This positive impact conforms with the results of other studies, which claim that certification has improved the relationship with the local population, local business, and enhanced their participation in the decision-making and planning processes [4,10,28]. On the other hand, some studies show that although there is a number of social advantages linked to FSC certification, *"the difficulties in meeting social goals appear to predominate"* [78].

The majority of interviewees also recognize that FSC certification improved the conservation status of forests and that the measures that were undertaken made their forest operations more environmentally friendly, especially in BiH and Serbia, where public forest companies implemented certain measures, such as the identification of HCVPs (Principle 9). To illustrate this, interviewees said:

“Prior to FSC, we did not have HCVPs” [BiH3] . . . “now, HCVPs are designated and management of such forests is clearly defined” [BiH5, BiH6]. As regards to Principle 9, interviewees in Slovenia and Croatia underline that several measures of forest protection were in force even prior to the implementation of FSC certification. This is due to the fact that, in selected SEE countries, SFM has a long tradition, therefore, the necessary modifications were usually minor. This was also confirmed in previous studies, which claim there is considerable evidence proving the positive effect of certification with regard to environmental aspects [4,10]. In this context, it is necessary to provide appropriate training for forest companies’ employees in relation to several aspects of the environmental impact and ensure adequate integration of this process into FM planning and implementation. A good example that illustrates the needs for the development of staff capacities is the concept of HCVPs. The concept of assignment and conservation of some forests for special purposes was always legally prescribed by the forest legislation in selected SEE countries. Nevertheless, only upon introducing the HCVPs concept, did these ideas become formalized in terms of written plans that clearly define conservation values, on-site borders, and maps, as well as FM regimes. Furthermore, close cooperation with other interest groups and local populations in the process of identification of HCVPs led to improved relations between all forest policy actors. Overall, certified forest companies implemented a number of measures to make their forest operations more environmentally friendly (Principle 6). They clearly recognize the positive impacts of certification on environment and ecosystem services, because rare and endangered species were identified and protected [BiH1, BiH3, BiH5, BiH6, SER9], chemical and toxic waste was properly managed [SLO10, BiH1, BiH6], the use of pesticides was prohibited or only chemicals approved by the FSC were used [BiH6, CRO8, SLO11, SER9], environmental incidents were prevented [BiH2, BiH6, SER9] and water resources were protected and well managed [BiH1, BiH4, BiH6, CRO8, SLO11, SER9]. In addition, they point out that: *“FSC certification has contributed to the harmonization of relations with nature protection sector and raised awareness about biodiversity conservation” [SER10].* Moreover, some interviewees noted that FSC certification encouraged companies to take a more environmentally proactive role. For instance, companies are now putting more effort into raising environmental awareness, which is evidenced in their statements: *“Every year, on International Forest Day and International Earth Day, we organize lectures in local schools. We also organize the collection of waste near main roads and in forests. There is an ecological calendar on the company’s web site and we published articles in newspapers to inform public about the important ecological events and dates” [BiH1].* Notably, some public forest companies went beyond FSC compliance in order to achieve positive environmental and social changes (e.g., reduction of conflicts with communities, the collection of waste and the careful use of pesticides in FM practice). This provides other companies and policy decision makers with an example of the aspiration for creation of “smart regulation” policy mixes [79,80].

Professionals responsible for certification in companies also pointed out that Principle 1, Principle 8 (average value of 3.5, respectively) and Principle 5 (average value 3.3) contributed to the improvement of SFM. Companies reported some changes related to legal aspects (Principle 1) in order to comply with FSC certification standards. In most cases, interviewees claim that the company’s business was in accordance with national legislation even before certification [BiH1, BiH3, BiH5, SER9, CRO8, SLO11], but they also reported some positive influences of FSC certification on legal aspects: *“Before FSC certification, national legislation from other sectors was out of our scope of interest. Now we are more aware of them and we also maintain a register of laws, so that we do not come into conflict with them” [BiH1].* This was also confirmed in the study carried out by WWF [41], which showed that FSC certification has proven to be an effective mechanism for assisting the forest companies to implement legal requirements, especially compliance with EU legislation. The interviewees also highlighted that although the laws are to be respected, in some cases, Principle 1 is somehow stricter than current legislation. For example: *“The law allows us to use various pesticides. The FSC standard clearly determines which ones are not allowed and even if we legally can use them we give the priority to FSC and do not use them” [SER9].*

One of the requirements of FSC certification is also connected with the implementation and effectiveness of the monitoring system (Principle 8). Therefore, forest companies made many substantial

improvements in their record keeping, internal program monitoring and development of a chain of custody. The interviewees claim that now: "... due to FSC, various types of controls related to monitoring and assessment of FM is carried out, based on them the necessary activities are undertaken" [BiH5]. With respect to monitoring and tracing the origin of forest products, companies have established their own monitoring systems. As explained: "The supply chain for our company ends at the forest road or at the buyers to whom we deliver wood assortments. Traceability is ensured through the system of delivery notes, invoices and logs' identification plates" [SLO11]. The contribution of forest certification to the effectiveness of the monitoring system has also been presented in other studies [4,14,81]. Generally, it is indicated that forest certification has led to positive changes in administration, monitoring and planning, which is also confirmed by interviewees in selected countries.

Companies reported some additional social and economic benefits related to Principle 5, e.g., an increased use of non-timber forest products (NTFPs) after the implementation of FSC certification, especially in BiH and Serbia. For example: "The main activity of company was production of timber, everything else was neglected ... now with FSC certification also NTFPs are important for company's income. Nowadays company price list also includes NTFPs for which, prior to receiving the FSC certification, no one even dreamed of being on the price list" [BiH1]. In some SEE countries, forest companies also reported that they receive additional income from hunting [BiH6], wooden furniture [BiH1, SER9] and biomass [CRO8].

According to the interviewees, Principle 7 (average value 3.2) and Principle 2 (average value 2.8) have the lowest contribution to SFM. Regarding Principle 7, interviewees explained that FM was regulated by FM plans even before FSC certification in all the selected SEE countries [BiH1, BiH3, SER9, CRO8, SLO11]. The long tradition of SFM practises and FM planning exists in selected SEE countries as it was confirmed by the following statements: "Given the very detailed FM planning system, there have been very few changes" [CRO8] or "FM is in harmony with long tradition of FM planning and SFM" [SLO11]. The most important change was in the improvement of FM plans, in terms of environmental impact assessment [BiH1, CRO8, SER9, SER10], as according to the interviewees: "... new elements are included in forest management plans (HCVs, buffer zones, etc.)" [SER10]. Although forest certification is generally considered as an effective tool for the improvement of FM planning [4,37], the interviewees do not think so. This can be explained by the fact that FM plans are mandatory documents for FM activities in state forests, and their content is legally prescribed by forest legislation. The interviewees also stated, long-term tenure and user rights of the land and forests resources were legally defined before implementation of FSC certification: "Ownership and user rights were defined before certification, so this Principle has not changed the situation" [SER10, BiH3], and there are laws and cadastre in which these rights are defined: "Ownership and user rights are stated in law very specifically, so there are no any dilemmas and problems in that sense" [SLO11, BiH6, CRO8]. Bearing in mind the long tradition of land cadastre and land-use policy in selected SEE countries (starting from Austro-Hungarian monarchy, over Yugoslavian Kingdom to the period of Socialist Yugoslavia), it is not surprising that forest certification, as a potential driver of change in FM practices, did not influence the issues related to long-term tenure and use rights to forest land significantly.

Apart from the promotion of general SFM practices, the expected benefits from FSC forest certification may result in better economic performances of forest companies, improved relations with consumers, stronger competitiveness, as well as improving the companies' image to the general public. The economic effects of certification were, on average, evaluated by interviewees as being low (average value 2.7). There are two reasons for this: the current situation in the wood market is characterised by a higher demand than supply, with no problems regarding the selling of wood [BiH3, BiH4, BiH5, BiH6, CRO8, SER10, SLO11]; and second, having an FSC certificate did not result in any price premiums or increased sales [BiH3, BiH4, BiH6 and SLO11], as explained: "Owning FSC certificate did not bring our products higher prices on the market, but on the other hand, there are direct and indirect costs for maintaining the certificate" [BiH3]. However, there were some indirect positive effects, such as: "FSC certainly gives the company access to customers with high demands as well as environmentally sensitive markets" [SLO11] and "... this has helped to keep certain markets, especially during the 2008 global recession"

[CRO8]. A total of one-quarter of the interviewees reported a generally positive contribution of FSC certification to the economic effects: " ... in long-term or in case of a market disturbance, the economic effects will be more noticeable, as economically stable and export-oriented customers will need certificated wood" [BiH5]. The relatively low economic effects of certification are also connected with certification costs which were probably a heavy burden for public forest companies to bear. Many of the public forest companies that expected to increase profits with price premiums and increased sales have only received symbolic economic benefits so far, despite a heavy outlay of cost and efforts for FSC certifications. This result is consistent with the work of Rametsteiner and Simula [4] and Gafo Gomez Zamalloa et al. [10]. Furthermore, some public forest companies in selected SEE countries obtained FSC certification recently, therefore, the certification costs still exceed the level of income. The FSC has reported that, on average, it took six years for a company to break even on its investment in FSC certification [82].

Almost two-thirds of interviewees said that their companies frequently (6–10 times per year) receive demands for certified wood. The majority of public forest companies reported only a few new client acquisitions through FSC and a lack of domestic market demands for FSC-certified products. However, it was clearly acknowledged that without an FSC certificate, forest companies would not be able to maintain their current client base or could not access high-demand international markets. FSC certification in selected SEE countries is, to a certain extent, perceived as a guarantee for the legality of wood operations and origin. In the case of EU Timber Regulation, exporters to the EU are requested by their EU clients to prove the origin of the wood. Although it is not the primary purpose of FSC certificates, they are often used to fulfil several requests related to the legality of wood sources, as it was argued in Gavrillut et al. [83]. Furthermore, the contribution of FSC certification to the improvement of a company's image was evaluated as high (average value 3.9), particularly in the eyes of customers, the general public and local communities.

The interviewed professionals suggested that forest certification has multiple effects that go beyond SFM of state forests. The same findings were found worldwide [8,10,26,27,29]. It is evident that instead of economic effects, FSC certification in selected SEE countries provides less measurable but equally important effects, such as improvements in public forest companies' image and better relations with customers, the general public and local communities.

5. Conclusions

Based on the analysis of 185 non-conformities in 24 FSC audit Public Summary Reports carried out in all the public forest companies in selected SEE countries (BiH, Croatia, Serbia and Slovenia), within the period 2014–2018, it can be concluded that FSC certification contributes to SFM, covering mainly social and ecological issues. This was further confirmed through interviews with responsible professionals for forest certification, based on their opinion on the overall effects of FSC certification on the management practices of these companies. The positive effects of FSC certification are most reflected in recognizing and partially solving issues related to worker's rights, health and safety issues, community relations, improving the image of forest companies, environmental impact assessment, nature protection and the maintenance of HCVs. The number of identified non-conformities (and requested corrective actions) is highest in those FSC principles that are associated with community relations and worker's rights and environmental impact. As all the public forest companies analysed were successful in the maintenance of FSC certificates, the real improvements occurred mostly in those performances connected with FSC Principles 4 and 6. However, in some re-certified forest companies, the most frequent non-conformities are constantly repeated or even increase. It is clear that forest certification alone cannot solve all these non-conformities as it is not the only driver of change in FM practices over time. The economic effects of FSC certification are less pronounced and mainly relate to better access and maintenance of the competitive position of specific markets. Although some features related to the effects of FSC certification on FM operations may depend on specific national social and economic contexts, significant differences between selected SEE countries related to the number of non-conformities in all the FSC Principles were not identified.

The limitation of this study relates to face-to-face interviews, where the sample was too small to be analysed statistically but seemed to attain a reasonable commonality in the interviews between selected SEE countries. For a comprehensive evaluation of the forest certification effects, it would be necessary to obtain the opinions of other affected stakeholders, such as trade unions, environmental NGOs, public forest administration, wood-processing industries, research institutions and the general public. This is important in light of the emergence of new and powerful forest policy actors (e.g., local communities and NGOs) and the increasing transparency of forest certification as a specific tool of forest policy. Another limitation of this study is that it mainly evaluates the contents of the official audit Public Summary Reports and underpins the non-conformities analysis. The limitations of information from these reports were argued in Hermudananto et al. [37] and were also considered in this study. Nevertheless, this study also has some restrictions, taking into account the assumption that audit reports faithfully represent the quality of management practices. Moreover, this study analyses the non-conformities regardless of the types of audit (main assessment and surveillance), targets a relatively small sample of audit reports ($n = 24$) and takes into account only a five-year period. For a thorough understanding of the certification's effects and its contribution to SFM, it is necessary to analyze all the audit reports in a specific country/region over a specific course of time. Therefore, future studies should address the differences of non-conformities across different types of audit and also target a larger sample size of certification audit reports (within a longer time period), which tend to reveal a wider range of challenges related to FM practices. In addition, future studies should address the differences of non-conformities across terrain conditions, management regimes and ownership types. Furthermore, the time taken for compliance and the aspect of using different auditors should be taken into account in future research. The failures to address non-conformities in time may indicate a company has difficulties in identifying the cause of the problem, a lack of understanding of what to do to solve it, a lack of the required human resources, or a lack of motivation regarding SFM and certification [37]. As regards to auditors, this analysis is based on the observations of different auditors, which means there is a likelihood of bias due to different auditors' background, knowledge, experiences and diligence, therefore, their assessments of FM compliance are likely to differ.

As a relatively new concept, FSC certification plays an important role in selected SEE countries by the identification of key problems in the management practices and business operations of forest companies. Indeed, forest certification as a voluntary mechanism appears as a specific market-based approach that combines, supplements and sometimes even replaces traditional instruments of forest policy. By promoting some key principles of the forest governance paradigm, such as participation, transparency and cross-sectoral dialogue, forest certification consolidated its position in the forest sectors of selected SEE countries.

Author Contributions: M.A. and Š.P.M. designed the research; D.B., B.M. and M.A. collected data for BiH; S.P. collected the data for Croatia; N.P. collected the data for Serbia; Š.P.M. collected data for Slovenia; D.B., B.M., prepared the databases; Š.P.M. and D.B. analysed the non-conformities data; J.N. and Š.P.M. analysed interview data and wrote the interview results; Š.P.M. and M.A. wrote other sections of the manuscript; M.A., D.B. and B.M. reviewed the manuscript and made editing.

Funding: This research was funded by Pahernik foundation. Authors wish to thank to the foundation for supporting the publishing of the results.

Acknowledgments: First, the authors wish to thank to all the interviewees who took part in this research and made it possible by sharing their FSC Public Summary Reports and experiences related to FSC certification. Finally, the authors wish to thank to the anonymous reviewers for their contributions to the improvement of our manuscript.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Appendix A

Table A1. Statistical results of Kruskal-Wallis test.

Independent Variable	Dependent Variable FSC FM Non-Conformities	Kruskal-Wallis H	<i>p</i>
Country	Principle 1	4.000	0.135
	Principle 2	3.000	0.223
	Principle 4	0.346	0.951
	Principle 5	0.000	1.000
	Principle 6	3.080	0.379
	Principle 7	4.520	0.211
	Principle 8	2.961	0.398
	Principle 9	2.500	0.475

Table A2. Statistical results of Mann-Whitney U test *.

Independent Variable	Dependent Variable FSC FM Non-Conformities	Mann-Whitney U	<i>z</i>	<i>p</i>
Re-certification	Principle 1	1.000	−0.816	0.414
	Principle 2	1.000	−0.577	0.564
	Principle 4	1.000	−2.708	0.007
	Principle 6	4.500	−1.967	0.049
	Principle 7	2.500	−0.262	0.793
	Principle 8	4.500	−1.420	0.156
	Principle 9	2.000	−1.118	0.264

* Mann-Whitney U test could not be performed for Principle 5, as there were missing values.

Table A3. Statistical results of Mann-Whitney U test *.

Independent Variable	Dependent Variable FSC FM Non-Conformities	Mann-Whitney U	<i>z</i>	<i>p</i>
EU integration	Principle 1	0.500	−1.225	0.221
	Principle 2	0.000	−1.732	0.083
	Principle 4	9.000	−0.217	0.828
	Principle 6	8.500	−0.325	0.746
	Principle 7	1.000	−1.623	0.105
	Principle 8	2.000	−1.627	0.104
	Principle 9	3.000	−0.559	0.576

* Mann-Whitney U test could not be performed for Principle 5, as there were missing values.

Table A4. Number of non-conformities by meta-categories and issues by country.

Meta-Category and Issue	Country			
	BiH N° (%)	Croatia N° (%)	Serbia N° (%)	Slovenia N° (%)
Environmental				
Aquatic and riparian areas	1 (7.7)			
Sensitive sites and HCVF	2 (15.4)	2 (66.7)		1 (100.0)
Threatened and endangered species	1 (7.7)		2 (100.0)	
Landscape-level of forest management	2 (15.4)			
Woody debris, snags and legacy trees	1 (7.7)			
Soil and erosion	6 (46.2)	1 (33.3)		
Sub-total of meta-category	11.4	17.6	4.7	9.1
Social				
Communication and conflict resolution	13 (25.5)	1 (25.0)	2 (15.4)	2 (40.0)
Training	10 (19.6)		3 (23.1)	1 (20.0)
Worker safety	26 (51.0)	3 (75.0)	7 (53.8)	2 (40.0)
NWFP				
Worker wages and living conditions	1 (2.0)			
Special cultural sites	1 (2.0)		1 (7.7)	
Sub-total of meta-category	44.7	23.5	30.2	45.5
Economic/Legal				
Profitability of operation	1 (4.2)			2 (100.0)
Compliance with regulations	23 (95.8)	3 (100.0)	10 (100.0)	
Illegal activities and trespassing				
Long-term tenure				
Sub-total of meta-category	21.1	17.6	23.3	18.2
Forest management				
Roads and skid trails	5 (19.2)			
Regeneration and reforestation	5 (19.2)	5 (71.4)	8 (44.4)	1 (33.3)
Chemical use and disposal	15 (57.7)	2 (28.6)	8 (44.4)	2 (66.7)
Exotic species and pets	1 (3.8)		1 (5.6)	
Conversion (to non-forest uses)			1 (5.6)	
Sub-total of meta-category	22.8	41.3	41.9	27.3

References

- MacDicken, K.G.; Sola, P.; Hall, J.E.; Sabogal, C.; Tadoum, M.; de Wasseige, C. Global progress toward sustainable forest management. *For. Ecol. Manag.* **2015**, *352*, 47–56. [[CrossRef](#)]
- FOREST EUROPE. State of Europe's Forests. In Proceedings of the Ministerial Conference on the Protection of Forests in Europe, Madrid, Spain, 20–22 October 2015; p. 314.
- Winkel, G. *Towards a Sustainable European Forest-Based Bioeconomy—Assessment and the Way Forward*; European Forest Institute: Joensuu, Finland, 2017; p. 162.
- Rametsteiner, E.; Simula, M. Forest certification—An instrument to promote sustainable forest management? *J. Environ. Manag.* **2003**, *67*, 87–98. [[CrossRef](#)]
- Buliga, B.; Nichiforel, L. Voluntary forest certification vs. stringent legal frameworks: Romania as a case study. *J. Clean. Prod.* **2019**, *207*, 329–342. [[CrossRef](#)]
- Auld, G.; Gulbrandsen, L.H.; McDermott, C.L. Certification Schemes and the Impacts on Forests and Forestry. *Ann. Rev. Environ. Resour.* **2008**, *33*, 187–211. [[CrossRef](#)]
- Galati, A.; Gianguzzi, G.; Tinervia, S.; Crescimanno, M.; La Mela Veca, D.S. Motivations, adoption and impact of voluntary environmental certification in the Italian Forest based industry: The case of the FSC standard. *For. Policy Econ.* **2017**, *83*, 169–176. [[CrossRef](#)]
- Sugiura, K.; Yoshioka, T.; Inoue, K. Improvement of forest management in Asia, through assessment of Forest Stewardship Council certification. *For. Sci. Technol.* **2013**, *9*, 164–170. [[CrossRef](#)]

9. Piketty, M.G.; Garcia Drigo, I. Shaping the implementation of the FSC standard: The case of auditors in Brazil. *For. Policy Econ.* **2018**, *90*, 160–166. [[CrossRef](#)]
10. Gafo Gómez-Zamalloa, M.; Caparrós, A.; San-Miguel Ayanz, A. 15 years of Forest Certification in the European Union. Are we doing things right? *For. Syst.* **2011**, *20*, 81–94. [[CrossRef](#)]
11. Kraxner, F.; Schepaschenko, D.; Fuss, S.; Lunnan, A.; Kindermann, G.; Aoki, K.; Dürauer, M.; Shvidenko, A.; See, L. Mapping certified forests for sustainable management—A global tool for information improvement through participatory and collaborative mapping. *For. Policy Econ.* **2017**, *83*, 10–18. [[CrossRef](#)]
12. Rafael, G.C.; Fonseca, A.; Jacovine, L.A.G. Non-conformities to the Forest Stewardship Council (FSC) standards: Empirical evidence and implications for policy-making in Brazil. *For. Policy Econ.* **2018**, *88*, 59–69. [[CrossRef](#)]
13. FSC. *FSC Principles and Criteria for Forest Stewardship*; Forest Stewardship Council: Boon, Germany, 2015; p. 32.
14. Halalisan, A.F.; Ioras, F.; Korjus, H.; Avdibegović, M.; Marić, B.; Pezdevšek Malovrh, Š.; Abrudan, I.V. An Analysis of Forest Management Non-Conformities to FSC Standards in Different European Countries. *Not. Bot. Horti Agrobi.* **2016**, *44*, 634–639. [[CrossRef](#)]
15. Van der Ven, H.; Cashore, B. Forest certification: The challenge of measuring impacts. *Curr. Opin. Env. Sust.* **2018**, *32*, 104–111. [[CrossRef](#)]
16. Pappila, M. Forest certification and trust — Different roles in different environments. *For. Policy Econ.* **2013**, *31*, 37–43. [[CrossRef](#)]
17. Tröster, R.; Hiete, M. Success of voluntary sustainability certification schemes—A comprehensive review. *J. Clean. Prod.* **2018**, *196*, 1034–1043. [[CrossRef](#)]
18. Johansson, J. Challenges to the Legitimacy of Private Forest Governance—The Development of Forest Certification in Sweden. *Environ. Policy Gov.* **2012**, *22*, 424–436. [[CrossRef](#)]
19. Giessen, L.; Burns, S.; Sahide, M.A.K.; Wibowo, A. From governance to government: The strengthened role of state bureaucracies in forest and agricultural certification. *Policy Soc.* **2016**, *35*, 71–89. [[CrossRef](#)]
20. Johansson, J.; Lidestav, G. Can voluntary standards regulate forestry?—Assessing the environmental impacts of forest certification in Sweden. *For. Policy Econ.* **2011**, *13*, 191–198. [[CrossRef](#)]
21. Auld, G.; Gulbrandsen, L.H. Transparency in Nonstate Certification: Consequences for Accountability and Legitimacy. *Glob. Environ. Politi.* **2010**, *10*, 97–119. [[CrossRef](#)]
22. Peña-Claros, M.; Bongers, F. An indirect way to evaluate the impact of certification. In *Biodiversity Conservation in Certified Forests*; Sheil, D., Putz, F.E., Zagt, R.J., Eds.; Tropenbos International: Wageningen, The Netherlands, 2010; pp. 131–136.
23. Paluš, H.; Parobek, J.; Šulek, R.; Lichý, J.; Šálka, J. Understanding Sustainable Forest Management Certification in Slovakia: Forest Owners' Perception of Expectations, benefits and Problems. *Sustainability* **2018**, *10*, 2470. [[CrossRef](#)]
24. Carlsen, K.; Hansen, C.P.; Lund, J.F. Factors affecting certification uptake — Perspectives from the timber industry in Ghana. *For. Policy Econ.* **2012**, *25*, 83–92. [[CrossRef](#)]
25. Tian, N.; Lu, F.; Joshi, O.; Poudyal, C.N. Segmenting Landowners of Shandong, China Based on Their Attitudes towards Forest Certification. *Forests* **2018**, *9*, 2. [[CrossRef](#)]
26. Sugiura, K.; Oki, Y. Reasons for Choosing Forest Stewardship Council (FSC) and Sustainable Green Ecosystem Council (SGEC) Schemes and the Effects of Certification Acquisition by Forestry Enterprises in Japan. *Forests* **2018**, *9*, 173. [[CrossRef](#)]
27. Cabbage, F.; Diaz, D.; Yapura, P.; Dube, F. Impacts of forest management certification in Argentina and Chile. *For. Policy Econ.* **2010**, *12*, 497–504. [[CrossRef](#)]
28. Tricallotis, M.; Gunningham, N.; Kanowski, P. The impacts of forest certification for Chilean forestry businesses. *For. Policy Econ.* **2018**, *92*, 82–91. [[CrossRef](#)]
29. Şen, G.; Güngör, E. Local Perceptions of Forest Certification in State-Based Forest Enterprises. *Small-scale For.* **2019**, *18*, 1–19. [[CrossRef](#)]
30. Masters, M.; Tikina, A.; Larson, B. Forest certification audit results as potential changes in forest management in Canada. *For. Chron.* **2010**, *86*, 455–460. [[CrossRef](#)]
31. Cerutti, P.O.; Tacconi, L.; Nasi, R.; Lescuyer, G. Legal vs. certified timber: Preliminary impacts of forest certification in Cameroon. *For. Policy Econ.* **2011**, *13*, 184–190. [[CrossRef](#)]
32. Jaung, W.; Putzel, L.; Bull, G.Q.; Kozak, R.; Elliott, C. Forest Stewardship Council certification for forest ecosystem services: An analysis of stakeholder adaptability. *For. Policy Econ.* **2016**, *70*, 91–98. [[CrossRef](#)]

33. Jaung, W.; Putzel, L.; Bull, G.Q.; Guariguata, M.R.; Sumaila, U.R. Estimating demand for certification of forest ecosystem services: A choice experiment with Forest Stewardship Council certificate holders. *Ecosyst. Serv.* **2016**, *22*, 193–201. [[CrossRef](#)]
34. Savilaakso, S.; Guariguata, M.R. Challenges for developing Forest Stewardship Council certification for ecosystem services: How to enhance local adoption? *Ecosyst. Serv.* **2017**, *28*, 55–66. [[CrossRef](#)]
35. Nikolaeva, A.S.; Kelly, M.; O'Hara, K.L. Differences in Forest Management Practices in Primorsky Krai: Case Study of Certified and Non-certified by Forest Stewardship Council Forest Concessions. *J. Sustain. For.* **2019**, *38*, 471–485. [[CrossRef](#)]
36. Newsom, D.; Bahn, V.; Cashore, B. Does forest certification matter? An analysis of operation-level changes required during the SmartWood certification process in the United States. *For. Policy Econ.* **2006**, *9*, 197–208. [[CrossRef](#)]
37. Hermudananto; Romero, C.; Ruslandi; Putz, F.E. Analysis of corrective action requests from Forest Stewardship Council audits of natural forest management in Indonesia. *For. Policy Econ.* **2018**, *96*, 28–37. [[CrossRef](#)]
38. Newsom, D.; Hewitt, D. *The Global Impacts of SmartWood Certification*; Rainforest Alliance: New York, NY, USA, 2005; p. 39.
39. Blackman, A.; Raimondi, A.; Cubbage, F. Does forest certification in developing countries have environmental benefits? Insights from Mexican corrective action requests. *Int. For. Rev.* **2017**, *19*, 247–264. [[CrossRef](#)]
40. Muthoo, M. Certification and sustainable forest management. In Proceedings of the International Workshop of Experts on Financing Sustainable Forest Management, Oslo, Norway, 22–25 January 2001; pp. 22–25.
41. WWF European Forest Programme. The Effects of FSC Certification in Estonia, Germany, Latvia, Russia, Sweden and the United Kingdom: An Analysis of Corrective Action Requests. 14 February 2005. Available online: <http://d2ouvy59p0dg6k.cloudfront.net/downloads/fscsummaryanalysisallcountries.pdf>. (accessed on 12 March 2019).
42. Hain, H.; Ahas, R. Impacts of sustainable forestry certification in European forest management operations. In *Management of Natural Resources, Sustainable Development and Ecological Hazards III*; Brebbia, C.A., Ed.; WIT Press: Ashurst, UK, 2006; pp. 207–218.
43. Avdibegović, M. The application of FSC principles as external standards of forest certification in Bosnia-Herzegovina. *Work. Fac. For. Univ. Sarajevo* **2001**, *31*, 65–71.
44. Avdibegović, M.; Šaković, Š.; Koričić, Š. Cross-sectoral dialogue as the base for development of internal forest certification standards in Bosnia-Herzegovina. In Proceedings of the First Symposium on veterinary, agriculture and forestry in Bosnia-Herzegovina, Sarajevo, Bosnia and Herzegovina, January 2003; p. 331. Available online: http://www.fefr.org/files/attachments/publications/proceedings-green_2014.pdf. (accessed on 13 March 2019).
45. Avdibegović, M.; Shannon, M.; Bećirović, D.; Mutabdžija, S.; Marić, B.; Pezdevšek Malovrh, Š. Assessing forest governance in the Federation of Bosnia-Herzegovina: Views of forestry professionals. In *Forest under Pressure—Local Responses to Global Issues*; Katila, P., Galloway, G., De Jong, W., Pacheco, P., Mery, G., Eds.; IUFRO Headquarters: Vienna, Austria, 2014; p. 321.
46. Bakarić, M.; Martinić, I.; Landekić, M.; Pandur, Z.; Orlović, A. Certifikacija šuma kao mehanizam unaprjeđenja gospodarenja šumskim resursima. *Nova Mehanizacija Šumarstva* **2015**, *36*, 63–76.
47. Avdibegović, M.; Brajić, A.; Marić, B.; Bećirović, D. *Šume Visoke Zaštitne Vrijednosti u Bosni i Hercegovini—Vodič za Izdvojanje, Gospodarenje i Monitoring*; WWF Adria: Zagreb, Croatia, 2017; p. 190.
48. Avdibegović, M.; Vojniković, S.; Bogunić, F.; Kunovac, S.; Hajrudinović, A.; Dautbašić, M.; Brajić, A.; Balić, B.; Delić, S.; Mutabdžija, S.; et al. *Razvoj Regulatornih Instrumenata šumarske Politike—Izdvojanje šuma visoke zaštitne Vrijednosti (HCVF) na Području Š.P.P. "Igmansko" (Faza I)*; Faculty of Forestry, University of Sarajevo Sarajevo: Sarajevo, Bosnia and Herzegovina, 2012; p. 78.
49. Dautbašić, M.; Ioras, F.; Avdibegović, M.; Balić, B.; Mekić, F.; Aburdan, I. The impact of establishing High Conservation Value Forest (HCVF) on forest policy in Bosnia and Herzegovina. In Proceedings of the Legal Aspects of European Forest Sustainable Development, the 6th International Symposium on Legal Aspects of European Forest Sustainable Development, Poiana Brasov, Romania, 16–20 June 2004; pp. 29–34.
50. Ioras, F.; Aburdan, I.V.; Dautbašić, M.; Avdibegović, M.; Gurean, D.-M.; Ratnasingam, J. Conservation gains through HCVF assessments in Bosnia-Herzegovina and Romania. *Biodivers. Conserv.* **2009**, *18*, 3395–3406. [[CrossRef](#)]

51. Marić, B.; Avdibegović, M.; Blagojević, D.; Bećirović, D.; Brajić, A.; Mutabdžija, S.; Delić, S.; Pezdevšek Malovrh, Š. Conflicts between forestry and wood-processing industry in Bosnia-Herzegovina: Reasons, Actors and Possible Solutions. *SEEFOR* **2012**, *3*, 41–48. [[CrossRef](#)]
52. Avdibegović, M.; Marić, B.; Bećirović, D.; Mutabdžija Bećirović, S.; Pezdevšek Malovrh, Š. Forest certification in Bosnia-Herzegovina and Slovenia: Obstacles and effects. In Proceedings of the International Conference on Natural Resources, Green Technology and Sustainable Development, Zagreb, Croatia, 5–7 October 2016; pp. 8–14.
53. Janež, P. Analiza skladnosti trajnostnega gospodarjenja v državnih gozdovih Slovenije z zahtevami FSC certifikata. Bachelor's Thesis, Univerza v Ljubljani, Oddelek za gozdarstvo in obnovljive gozdne vire, Ljubljana, 2016.
54. Popović, K. Efekti certificiranja na gospodarenje šumskim resursima u Republici Hrvatskoj. Bachelor's Thesis, Univerzitet u Bihaću, Biotehnički fakultet, Odsjek za šumarstvo, Bihać, 2016.
55. Velojić, M.; Kovač, S.; Vasić, V. Sertifikacija šuma-prilagođavanje gazdovanja šumama savremenim shvatanjima održivog gazdovanja na primeru JP "Vojvodinašume". *Topola* **2018**, *201/202*, 157–165.
56. FSC. *FSC Principles and Criteria for Forest Stewardship*; Forest Stewardship Council: Bonn, Germany, 2002; Vol. FSC-STD-01-001 (version 4-0) EN; p. 13.
57. ZGS. *Poročilo Zavoda za gozdove Slovenije o gozdovih za leto 2017*; Zavod za gozdove Slovenije: Ljubljana, Slovenia, 2018; p. 141.
58. FSC. FSC Public Search. Available online: <https://info.fsc.org/certificate.php> (accessed on 12 March 2019).
59. Lazibat, T.; Baković, T. Primjena međunarodnih normi u hrvatskoj šumarskoj i drvnoj industriji. *EFZG-Serija članaka u najstajanju* **2006**, *6*, 18.
60. Srbijašume. PE Srbijašume Forest Resources. Available online: <http://www.srbijasume.rs/sumskifond.html> (accessed on 26 March 2019).
61. Vojvodinašume. PE Vojvodinašume Annual Business Program. Available online: <http://www.vojvodinasume.rs/wp-content/uploads/2012/04/Godi%C5%A1nji-program-poslovanja-za-2017-god.pdf> (accessed on 26 March 2019).
62. FAO. The Forest Sector in Bosnia and Herzegovina—Preparation of IPARD Forest and Fisheries Sector Reviews in Bosnia and Herzegovina. 2015, p. 153. Available online: <http://www.fao.org/3/a-au015e.pdf> (accessed on 26 March 2019).
63. Institute for Statistics of FBiH. Forestry in the Federation of Bosnia and Herzegovina. Institute for Statistics of FBiH Sarajevo. 2018, p. 19. Available online: http://www.bhas.ba/?option=com_content&view=article&id=46&lang=en (accessed on 26 March 2019).
64. Institute of Statistics of Republika Srpska. *Forestry 2018*. pp. 14–15. Available online: http://www2.rzs.rs.ba/static/uploads/bilteni/mesecni_statisticki_pregled/2018/Mjesecni_statisticki_pregled_Februar_2018_web.pdf (accessed on 26 March 2019).
65. Čomić, D. Analiza potreba i mogućnosti FSC certificiranja privatnih šuma u Republici Srpskoj. *Glasnik šumarskog fakulteta Univerziteta u Banja Luci* **2011**, *6*, 49–72.
66. FSC. FSC Facts & Figures. Available online: <https://ic.fsc.org/en/facts-and-figures> (accessed on 12 March 2019).
67. Creswell, J.W. *Research Design: Qualitative, Quantitative and Mix Method Approach*, 3rd ed.; SAGE Publication: Thousand Oaks, CA, USA, 2008; p. 296.
68. Corp, I. *IBM SPSS Statistics for Windows, 20.0*; IBM Corp.: Armon, NY, USA, 2011.
69. Krippendorff, K. *Content Analysis: An Introduction to Its Methodology*, 2nd ed.; SAGE Publications: Thousand Oaks, CA, USA, 2004; p. 422.
70. Verbi GmbH. *MAXQDA 2018*; VERBI Software: Berlin, Germany, 2018.
71. Di Lallo, G.; Maesano, M.; Masiero, M.; Mugnozza, G.S.; Marchetti, M. Analyzing Strategies to Enhance Small and Low Intensity Managed Forests Certification in Europe using SWOT-ANP. *Small-scale For.* **2016**, *15*, 393–411. [[CrossRef](#)]
72. Leite, M.V.S.; Antunes, A.F.F.; Cabacinha, C.D.; Assis, A.L.; da Gama, A.T.; Pereira Sales, N.d.L. Compliance with Environmental and Social Legislation in Certified Forestry Companies. *Floresta e Ambient.* **2018**, *25*, 11. [[CrossRef](#)]
73. Horodnic, S.A. A risk index for multicriterial selection of a logging system with low environmental impact. *Environ. Impact Assess. Rev.* **2015**, *51*, 32–37. [[CrossRef](#)]

74. Proto, A.R.; Bacenetti, J.; Macrì, G.; Zimbalatti, G. Roundwood and bioenergy production from forestry: Environmental impact assessment considering different logging systems. *J. Clean. Prod.* **2017**, *165*, 1485–1498. [[CrossRef](#)]
75. Blackman, A.; Raimondi, A.; Cubbage, F. Analysis of Corrective Action Requests Issued to FSC Certified Forests in Mexico. 2013, p. 35. Available online: <https://www.tncmx.org/alianza-mredd/wp-content/uploads/Files/Biblioteca%20Territorios/pa00ks6b.pdf> (accessed on 28 March 2019).
76. FSC. *General Requirements for FSC Accredited Certification Bodies*; Forest Stewardship Council: Bonn, Germany, 2015; p. 82.
77. Nebel, G.; Quevedo, L.; Bredahl Jacobsen, J.; Helles, F. Development and economic significance of forest certification: The case of FSC in Bolivia. *For. Policy Econ.* **2005**, *7*, 175–186. [[CrossRef](#)]
78. Boström, M. The problematic social dimension of sustainable development: The case of the Forest Stewardship Council. *Int. J. Sustain. Dev. World Ecol.* **2012**, *19*, 3–15. [[CrossRef](#)]
79. Gunningham, N.; Sinclair, D. Regulatory Pluralism: Designing policy mixes for environmental protection. *Law Policy* **1999**, *21*, 49–76. [[CrossRef](#)]
80. Gunningham, N.; Grabosky, P. *Smart regulation. Designing Environmental Policy*; Oxford University Press: New York, NY, USA, 1999; p. 494.
81. Bass, S.; Thornber, K.; Markopoulos, M.; Roberts, S.; Grieg-Gran, M. *Certification's Impacts on Forests, Stakeholders and Supply Chains*; International Institute for Environment and Development: London, UK, 2001.
82. Breukink, G.; Levin, J.; K., M. Profitability and Sustainability in Responsible Forestry—Economic Impacts of FSC Certification on Forest Operators. World Wide Fund for Nature: Gland, Switzerland, 2015; p. 48.
83. Gavrilut, I.; Halalisan, A.F.; Giurca, A.; Sotirov, M. The Interaction between FSC Certification and the Implementation of the EU Timber Regulation in Romania. *Forests* **2016**, *7*, 3. [[CrossRef](#)]



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).