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Research

Biodiversity conservation through forest certification: key factors shaping national Forest Stewardship Council (FSC) standard-development processes in Canada, Sweden, and Russia

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ABSTRACT. Our work focuses on the Forest Stewardship Council (FSC), one of the most stringent, but also contested certification schemes for sustainable forestry. Responding to criticisms concerning inconsistency at the national level, FSC-International recently increased the prescriptiveness of its international standards, including the development of biodiversity-related International Generic Indicators (IGIs). We aim to understand recent efforts in Canada, Sweden, and Russia to revise national-level FSC standards in line with biodiversity-related IGIs. What were the key factors influencing the standard-development process and its outcomes? Were stakeholders satisfied with the negotiations and what was finally achieved? The data were drawn from semi-structured interviews with key participants, a comparative analysis of biodiversity-related indicators in newly approved FSC standards, and analysis of reports prepared by national FSC offices. We applied the Institutional Development and Analysis framework within a complex systems approach to identify multiple interconnected factors that shaped standard-development processes and outcomes in each country. Our findings indicate that despite persistent efforts of FSC-International to harmonize FSC standards across all countries, there are a number of interrelated key factors, which influence outcomes at the national level. Four common clusters of endogenous factors were key to standard-development processes and outcomes in each of these countries: process-related factors, biodiversity-related actions, desired level of control over biodiversity-related outcomes, and adequacy of available knowledge about biodiversity. Forest governance was the only common cluster of key exogenous factors in Sweden and Russia, many of which were identified as constraining the emergence of a consensus-oriented negotiation process. Our findings indicate that efforts to enhance the consistent performance of forest certification for biodiversity conservation require an improved understanding of negotiation outcomes as the emergent products of interactions between multiple exogenous and endogenous factors. This implies a need for a greater focus on process management aspects during future negotiations.

Key Words: *forest governance; Ostrom's framework; sustainable certification scheme; systems analysis*

INTRODUCTION

Biodiversity plays a key role in human well-being (IPBES 2018). Concern over the negative effects of rapid biodiversity loss on social-ecological systems (SES) has driven governments and other actors to set ambitious global targets for biodiversity conservation. However, how best to achieve these targets, and the efficacy of governmental command and control mechanisms for protecting biodiversity, remains the subject of major debate.

Transnational private sustainability governance initiatives have emerged as an important strategy for tackling global environmental challenges, including biodiversity loss. Such initiatives build on private regulations, i.e., guidelines and standards, issued by multi-stakeholder consortia, multinational corporations, or international organizations (Grabs 2021, Graz 2021, Wood 2021). Different voluntary market-based certification standards such as forest certification (Auld et al. 2008*a*) and eco-labeling (Amacher et al. 2004) have been established as an innovative and dynamic response to perceived failings or limitations in state-based ecological and social policies (Cashore et al. 2003, Gulbrandsen 2004, Johansson 2014, Grabs 2021).

Much research to date on transnational private sustainability initiatives focuses on analyzing the conditions under which initiatives gain authority and legitimacy, as well as their relationship to competing regulatory schemes and state-based regimes (Bernstein and Cashore 2007, Dingwerth 2008, Eberlein et al. 2013). There is considerable debate regarding the relative stringency of various sustainability standards and the overall direction in which certification systems are evolving over time (Judge-Lord et al. 2020, Bartley 2021). This includes investigating differing levels of institutionalization across national contexts (Keskitalo et al. 2009) and the role of different factors, including public policy regimes, cultural norms, and domestic market conditions (McDermott et al. 2007, Bell and Hindmoor 2012). In the field of regulation and governance, there is an increasing tendency to see private norms as nested within complex regulatory ecosystems, made up of intersecting public and private regulations and institutions. This is particularly evident in the case of politically contested issues, such as biodiversity conservation in which certification has become a key arena for negotiating arrangements in situations in which norms are the subject of divergent interpretations.

The multi-level governance of voluntary private regulatory schemes can be examined from a diversity of angles. Some studies have focused on the emergence and institutionalization of new private regulatory tools driven by civil society actors (Auld et al. 2008*a*, Auld 2014) or have framed certification schemes as private law created by civil society (Meidinger 2007). In this body of literature, authors emphasize gaining regulatory authority and

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Table 1. Basic information about forest and forestry in Canada, Sweden, and Russia.

	Canada	Sweden	Russia
Total area of forests	347 M ha, or 35% of the total land	28 M ha, or 75% of the land area	815 M ha, or 50% of the total area
Total area of productive forest land	234.5 M ha	22.5 M ha	415 M ha
FSC-certified area	48.3 M ha, or 21% of productive forest land	11.7 M ha, or 52% of productive forest land	52.4 M ha, or 12% of productive forest land

the legitimacy of private authority (Bernstein and Cashore 2007, Dingwerth 2008, Eberlein et al. 2013). Other studies have focused on the institutionalization of new rules on the ground and the impact of implemented standards (Malets and Tysiachniouk 2009, Malets 2011). Others have explored how specific contexts, including institutions and culture, and practices of translation and contestation affect the standards-setting process and implementation of private sustainability initiatives (Tysiachniouk 2012, Tysiachniouk and McDermott 2016, Berger and Esguerra 2018, Bartley 2021, Graz 2021, Tysiachniouk et al. 2021, Teitelbaum et al. 2021). Of particular interest to us, are the "practices of translation" understood as "simultaneous processes of transportation and transformation" (Berger and Esguerra 2018:1). These include the practice of contestation, which refers to actions that aim at "rejecting standards or changing them so radically that power imbalances between actors can be inverted" (Graz 2021:5).

We focus on the Forest Stewardship Council (FSC) system, one of the most stringent, but also contested, transnational private sustainability forest certification schemes (Clark and Kozar 2011, Lindahl and Westholm 2011). As such, it provides a prime example of how the practices of translation and contestation shape the enactment of standards differently in different country contexts. Pioneered by transnational NGOs in the 1990s as a response to concerns about the ecological and social impacts of industrial timber production (Auld et al. 2008*a*, *b*), FSC now certifies over 202 million hectares of forest worldwide (https://fsc.org/en/forest-management-certification). Forest Stewardship Council certification mandates adherence to a set of global principles and criteria (P&C) covering environmental, social, and economic aspects of forest management (FSC 2015*a*). Forest Stewardship Council-International also recognizes the need to adapt standards to address differences in the biophysical and socio-political contexts of different countries, and hence requires national working groups to prescribe how P&C should be interpreted in the local context. Nationally developed standards are elaborated collaboratively through negotiations between national-level chambers, each representing broadly defined stakeholder interest groups, e.g., environmental, social, and economic. The FSC standard-development process is conducted in accordance with rules prescribed by FSC-International in all countries and constitutes one of FSC's core governance functions (Tysiachniouk and McDermott 2016). A key aim of these processes is to promote alignment between global P&C and national and local contexts (https://www.fsc.org; Auld et al. 2008*a*). However, the resulting variation between national FSC standards creates tension in the international marketplace, not least because uniformity and consistency play a critical role in FSC's international claims of legitimacy (Kärnä et al. 2003). Despite many studies concerning the ecological, political, and social outcomes of FSC (e.g., Galati et al. 2017, Sansalvador and Brotons 2020), there remains a lack of independent empirical evidence to explain the differences between standards, and to what extent they are owing to environmental or socio-political factors.

In response to concerns around inconsistency between standards, FSC-International has made efforts to add more prescription to its international standards to reduce national variation in their interpretation. The FSC has recently reversed its nationally driven approach whereby national working groups create national indicators to interpret the FSC P&C. In its stead, FSC has produced a set of international generic indicators (IGIs) to: (1) promote the consistent implementation of P&C around the globe; (2) improve the consistency and quality of national FSC standards; and (3) improve and strengthen the credibility of the FSC system. Since 2015, IGIs have been used as a starting point for updating and harmonizing existing national standards in many countries. National standard-setting processes may then adopt the IGIs verbatim, adapt them to local context, or drop them, subject to FSC approval.

Our aim is to understand how and why recent efforts in Canada, Sweden, and the Russian Federation (hereafter Russia) to revise FSC national standards according to the biodiversity-related IGIs have resulted in convergence or divergence of FSC standards among countries. What explains potential divergence regarding the assimilation of IGIs into national FSC standards? This is part of a broader research effort to characterize practices and outcomes related to FSC standard-setting processes in the area of biodiversity and rights of Indigenous peoples and local communities (Teitelbaum et al. 2021, Tysiachniouk et al. 2021). Such studies are critical for informing debates over the feasibility and/or desirability of global harmonization in transnational private sustainability governance. Altogether, Canada, Sweden, and Russia represent the largest FSC certified areas globally; Russia currently has the largest certified area (52.4 M ha) in the world, while Sweden has the highest proportion of certified forests (52%; Table 1). These countries have all recently developed national FSC standards following newly approved requirements of FSC-International.

Biodiversity conservation through forest certification

To address forest challenges, FSC forest certification has become an increasingly influential tool. The mechanisms and processes adopted by FSC certification have been described as some of the most important and innovative developments in contemporary environmental governance (Agrawal et al. 2008). However, in many countries FSC-certified forest management has also provoked considerable public debate (Elbakidze et al. 2011, 2015, Zaremba 2012), reflecting the diversity of actors and interests that hold a stake in its outcomes. This debate is further fueled by a

lack of adequate empirical evidence concerning FSC's progress in facilitating improvements in sustainability, including the conservation of biodiversity. Some consider forest certification to be an effective tool for biodiversity conservation in managed forests (e.g., Gulisson 2003), whereas other scholars have criticized the poor representation of biodiversity conservation principles in FSC forest-certification schemes (e.g., Elbakidze et al. 2011, Angelstam et al. 2013). Additionally, there are ongoing debates over how prescriptive or flexible, harmonized or locally adapted, national FSC standards should be on key issues of biodiversity conservation.

These debates are to some extent mirrored in current debates among stakeholders regarding the contribution of FSC-certified companies to biodiversity conservation in commercially used forests in all three of our studied countries: Canada, Sweden, and Russia. In Canada, integration of the protection of intact forest landscapes (IFLs) with traditional uses by Indigenous communities is a keenly debated issue. Indigenous peoples in Canada rely on forests for a wide variety of subsistence, cultural, and economic activities (Teitelbaum 2015). Protection of IFLs threatens to restrict certain traditional activities, mainly hunting and use of non-timber forest products. Another debated issue is the protection of boreal woodland caribou (*Rangifer tarandus caribou*). Despite a historical range covering over half of present-day Canada, the woodland caribou was designated as threatened in 2002 by the Committee on the Status of Endangered Wildlife in Canada and was included into the federal Species at Risk Act in 2012. The woodland caribou is extremely sensitive to both natural and human disturbance, particularly habitat damage and fragmentation brought about mainly by forestry and road building. In Sweden, there are strong concerns that the FSC-certified forest management does not improve forest biodiversity conservation (Elbakidze et al. 2011). One of the most contested issues is the identification and designation of woodland key habitats (WKH). A WKH is a forest area with high conservation value. This concept was introduced by the Swedish Forest Agency in the 1990s and has become an essential instrument in the conservation of biological diversity in production forests (Timonen et al. 2010). Since the concept came into use in the 1990s, large forest companies have been responsible for doing surveys and registering WKHs on their land. Unlike formally protected forests, WKHs lack legal status but they cannot be logged under FSC certification. Definitions for the concept have changed over the years, and the WKH concept and its application became issues of debate and confrontation among forest stakeholders in Sweden. There are still disagreements regarding operationalization of the WKH concept and about how the application should be regionally adapted (Bjärstig et al. 2019) and translated into the national FSC standard. In Russia, continuous logging of IFLs is one of the main reasons for the long-term confrontation between environmental NGOs and the FSC-certified forest companies. In many parts of Russia, IFLs are the main source of wood supply, and the proportion of logging within IFLs is high. Russia lost 18 M ha of IFLs between 2000-2013, largely due to industrial timber extraction and other land-use activities (Potapov et al. 2017). So-called "wood mining" remains widespread in Russia and is a particular problem for biodiversity conservation. Unsustainable logging of IFLs leads to their fragmentation and loss, especially in the boreal forests where the majority of IFLs are located (Greenpeace International 2014). The FSC system in Russia has been heavily criticized by environmental NGOs, particularly by Greenpeace Russia, for certification of forest companies with poor practices related to protection of biodiversity. There are also discussions regarding the potential for FSC to broaden its services to include forest conservation and restoration and ecosystem services (e.g., water sources/quality, soil stability, carbon storage), as well as economic opportunities for forest-dependent communities who rely on IFLs (Greenpeace International 2014).

ANALYTICAL FRAMEWORKS

This study applies a novel approach by fusing the Institutional Analysis and Development (IAD) framework (Ostrom 2005) with a complex systems approach (e.g., Wolstenholme and Coyle 1983, Bosch et al. 2007, Inam et al. 2015) to generate fundamental insights into the FSC standard-setting processes in different contexts. Although the IAD framework provides a well-established and integrative approach for understanding complex, multi-scalar interactions within natural resource governance systems, including in forest contexts (e.g., Gibson et al. 2000, Andersson et al. 2014, Romanelli and Boschi 2019), it has not previously been used to analyze standard-setting processes in transnational private sustainability governance initiatives. Using the IAD framework, we undertook a systematic assessment to identify and compare multiple factors of recent national FSC standard-setting processes regarding biodiversity indicators in Canada, Sweden, and Russia.

The IAD framework is a multi-tier conceptual map with three interconnected levels of actions (Ostrom 2005): (1) the operational level at which day-to-day activities of actors are carried out and directly affected, (e.g., the operational activities of individual stakeholders, such as foresters); (2) the collective-choice level at which decision makers create rules that impact actions at the operational level, (e.g., the national-level FSC negotiation process between environmental, economic, and social stakeholder-representative chambers as well as stakeholders); and (3) the constitutional-choice level at which global rules that directly affect collective choice participation are defined, designed, and affected, (e.g., FSC-International determines the composition of national-level chambers and their interactions and also defines global rules in terms of P&C of FSC-certified forest management that have a direct impact on actions at the two other levels). Although the FSC standards negotiation process, as a multi-scalar institution, could be analyzed at each of these tiers, this study focuses primarily on the collective-choice level. Given the potential impact on negotiation processes, a key research objective is to explore how the new biodiversity-related IGIs (imposed from the constitutional level) have been integrated at the national, i.e., collective-choice, level.

We focused on identifying three main components of the IAD framework (Ostrom et al. 1994, Ostrom 2005): (1) exogenous factors, i.e., biophysical conditions, institutions; (2) action situation, i.e., the standard-setting processes themselves, including actors and all interactions among them; and (3) outcomes, i.e., tangible outcomes such as agreed biodiversity-related indicators, and intangible outcomes in terms of perceived adequacy of outcomes and of the negotiation process itself.

To better understand the various causal mechanisms underlying dynamics within and among exogenous factors, action situation, and outcomes, we integrated the IAD framework with a complex systems approach. Such approaches have proven useful for perceiving the complexities of social-ecological systems in sustainability science and environmental governance and management (Elbakidze et al. 2015, Abson et al. 2017, Dawson et al. 2017, Dawson 2019). A complex systems approach provides both a holistic paradigm and a toolbox for engaging with these complexities (Checkland 1981, Susskind and Field 1996, Beall and Ford 2010) and is particularly useful for understanding emergent phenomena in relation to the contextual constraints from which they emerge (Chu et al. 2003, Cilliers et al. 2013).

In many studies that have previously applied the IAD framework, specific causal pathways by which, for example, exogenous factors influence outcomes remain largely unclear, and feedbacks are typically ignored. Consequently, although many scholars have indicated a high degree of interdependence in natural resource governance and management systems, i.e., that individual components iteratively or dialectically influence each other, the degree to which the IAD framework components are interdependent remains less known. The assumption of structural interdependence makes any piecemeal assessment of individual IAD components difficult and ultimately insufficient given that much of the influence of individual components may be exerted indirectly via influence on other drivers. We therefore used qualitative systems dynamics (e.g., Morecroft 1982, Wolstenholme 1999, 2003) to identify causal pathways connecting action situations, exogenous factors and outcomes, mapped these pathways as an integrated causal influence network, and analyzed resulting networks to understand the multiple ways by which various factors have shaped the standard-development process regarding biodiversity indicators in each country.

METHODS

The research was based on multiple qualitative methods: semi-structured interviews, comparative analysis of biodiversity-related indicators in newly approved FSC standards in each country, and analysis of reports prepared by national FSC offices regarding the FSC standard-development process in Canada, Sweden, and Russia.

Data collection: semi-structured interviews

In total, 45 semi-structured qualitative interviews were conducted with respondents who were involved in the standard-development process in each country in 2018-2019 (Table 2). This included representatives of social, environmental, and economic chambers, and FSC-national staff. The number of respondents differed among countries and depended on the total potential population of actors. For example, the environmental chamber in Sweden consisted of five members who represented two organizations, WWF-Sweden and BirdLife Sweden; we interviewed one respondent from each of these two organizations to explore environmental chamber perspectives on the standard-development process. The interview manual was developed and contained questions related to: (1) different stages of the standard-development process; (2) the most debated biodiversity-related IGIs; (3) actors and interactions during the negotiation, including power dynamics among different chambers; and (4) exogenous factors that influenced the standard-development process (see the interview protocol in Appendix 1). All interviews lasted from one to two hours. In Sweden and Canada, interviews were conducted in English, and in Russia interviews were conducted in Russian. All interviews were recorded digitally, then transcribed and the Russian interviews were translated into English.

Table 2. Number of respondents in each country who were interviewed regarding the standard-development process. Neither FSC-Sweden nor FSC-Russia have a dedicated Aboriginal chamber. Note: FSC = Forest Stewardship Council.

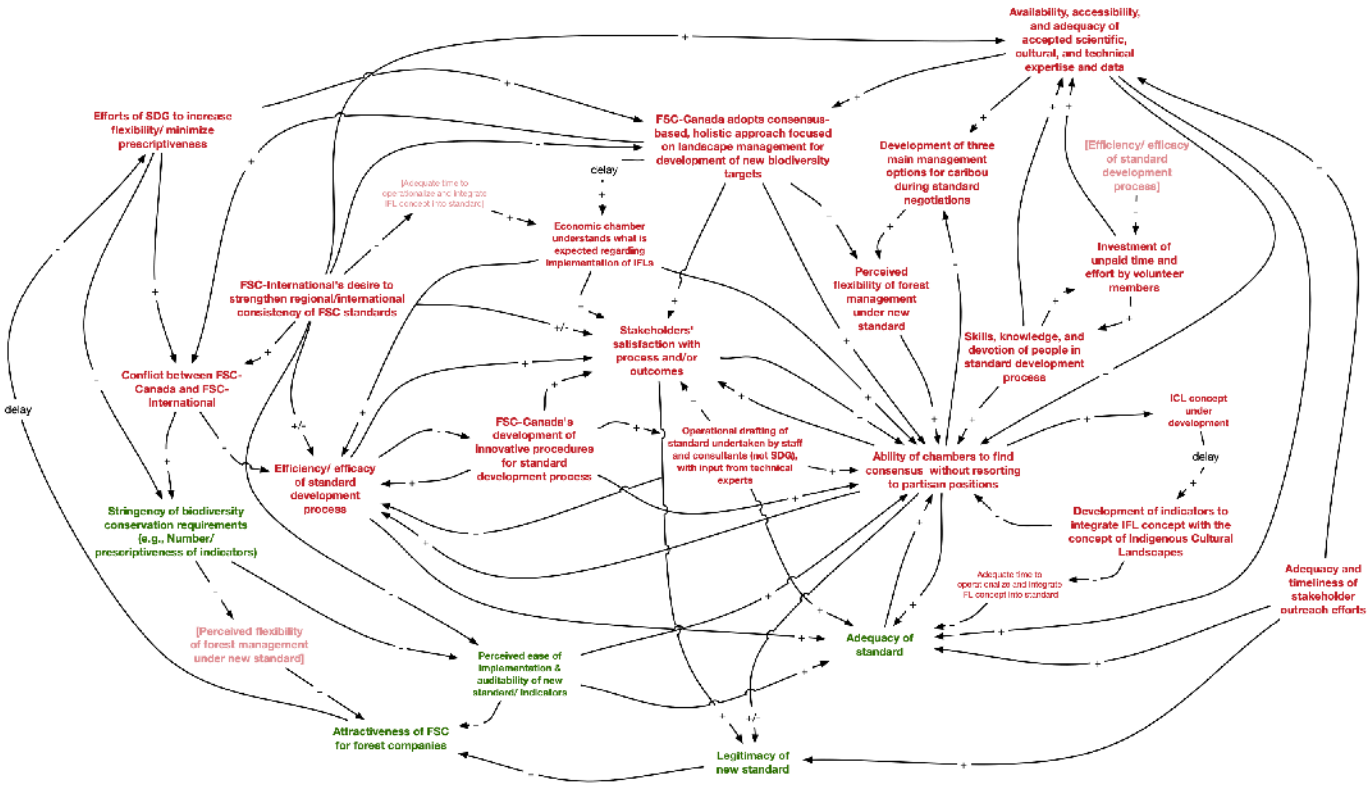
	Canada	Sweden	Russia
Environmental chamber	3	3	11
Economic chamber	2	5	5
Social chamber	2	1	4
Aboriginal chamber	3	N/A	N/A
FSC national staff	3	1	2
In total	13	10	22

Data analysis: identification of key factors and their causal relations

All transcripts were imported into the NVivo data analysis software. Using NVivo, we first created three nodes that corresponded to the three main components of the IAD framework, i.e., exogenous factors, action situations, and outcomes. Second, each component within the IAD framework was analyzed by clustering variables (Ostrom 2005), which were used to create sub-nodes. For example, the action situation node included sub-nodes of set of biodiversity-related actions, actors, level of control over outcomes, interactions, cost-benefits, information and knowledge available to actors, etc. All relevant data from each interview were extracted and organized within nodes and sub-nodes. Exogenous, action situation, and outcome variables were analyzed and assessed, focusing on the following questions: What or who is interacting? What drives and shapes the interactions? What is the character of interactions? What are the effects of interactions? How did interactions change over time?

Interview data were then assessed on a per case study basis using an open-coding technique to identify causal relationships between factors (Deegan 2009, Kim and Andersen 2012). For example, a number of Canadian respondents described how FSC-Canada's adoption of a holistic landscape-management approach led to conflicts with FSC-International. In this example, a causal relationship was identified linking the independent factor (FSC-Canada's adoption of a consensus-based, holistic approach based on landscape management for development of new biodiversity targets) to a change in the dependent factor (conflict between FSC-Canada and FSC-International). Causal data for each case study were aggregated in several iterative steps (e.g., Bureš 2017) before being organized into networks of nodes and edges describing key coded concepts and the causal relationships linking them. The structural properties of each case study causal network diagram were then analyzed using a number of graph theoretical statistics (Appendix 2), including degree, betweenness centrality, eigenvector centrality, and loop count (e.g., Gonzalès and Parrott 2012, McGlashan et al. 2016; Appendices 3, 4, 5). Taken together, these statistics were used to develop a structural "importance"

Fig. 1. A causal network diagram of the key factors underpinning the dynamics within and between the action situation and outcomes in Canada. Arrows connecting factors indicate the influence of a given factor on multiple processes within and between the action situation (red) and outcomes (green). Appendix 6 presents the causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors, and outcomes in Canada. Note: SDG = Standard Development Group; IFL = intact forest landscapes; ICL = Indigenous cultural landscapes; FSC = Forest Standards Council.



index of all coded factors and their causal relationships, per case study (Eden 2004, Oliva 2004, Montibeller and Belton 2006). These metrics essentially measure the number of unique connections identified per factor and some of the central structural properties of these connections, e.g., distance to other factors. A key underlying assumption is therefore that more important factors will be referred to more frequently and explored more thoroughly, in the coded interview data. The importance score of a node was derived by the frequency with which that node scored above the median for each of the selected metrics, resulting in a combined importance score for each node within the range 0-4, with 4 being the highest possible importance score. We identified the key factors as those that scored above the median for at least three of four metrics in the causal networks for each case study.

However, given that nodes at the very edge of the network (i.e., in-degree = 0) scored zero by definition for the two centrality and loop count metrics, these edge factors were identified as important if they scored > = median "degree." Key relationships were identified as those between key factors (intervening non-key factors were aggregated in such a manner as to retain all key relationships). These simplified dynamics were then compared and analyzed across the three cases to identify and visualize the key system dynamics of FSC standard-development processes. Detailed analyses of the causal network diagrams of key factors are presented in Results (Figs. 1-3); whereas the causal network diagrams of all identified factors can be found in Appendices 2, 3, and 4.

The reports on the standard-setting process provided to us by FSC offices in each country were analyzed. Our main focus was on comparing and contrasting how biodiversity-related IGIs in Principle 6 and Principle 9 were interpreted in the first and second drafts, and in the final version of the national FSC standards in Canada, Sweden, and Russia, respectively.

RESULTS

Canada

Action situation

The ability of the Standard Development Group (SDG) to find consensus without resorting to partisan positions was one of the most structurally important causal factors identified to influence specific tangible and intangible outcomes of the standard-development process in Canada. Stakeholders identified a broad set of action-situation factors influencing this ability to find consensus (Fig. 1; Appendix 6). For example, "FSC-Canada's development of innovative procedures for the standard development process" was identified by respondents as a key factor to enable the group to tackle difficult issues without resorting to partisan positions, and for improving the overall "efficiency and

efficacy of the standard development process." At least three such innovative procedures were identified. First, the SDG was kept quite small, only eight persons (two representatives from each chamber), allowing discussions to remain manageable and decisions to be made efficiently. Second, technical expert panels (TEPs) were created to assist in providing scientific, technical, and cultural expertise on critical topics when developing normative measures within the standard. These topics were identified through early public outreach efforts. As respondents stated, the mission of TEPs was to develop a standard (1) that forest companies can feasibly implement, and (2) that helps them to be competitive in the forest sector in Canada and globally. Third, FSC-Canada decided that, to allow the SDG to focus on the most complex and contested issues, the SDG "should not hold the pen." Rather, their main functions were to direct and review the work done and to make final decisions, whereas the operational task of drafting versions of the standard was undertaken by staff and consultants, with input from the TEPs.

The skills, knowledge, and devotion of people in the standard-development process were key factors for facilitating the ability of the SDG to find consensus and for improving the availability, accessibility, and adequacy of scientific and technical expertise and knowledge needed to adopt a holistic approach to biodiversity conservation and management.

> *People stuck it out during the four years because they realized what a privilege it was to be sitting around a table with people who have completely different perspectives and objectives, and to discuss the same topics and come to a common ground on it. I think people enjoyed that.* A consultant to the SDG.

At the same time, respondents commented that chambers were uneven in terms of available resources and capacities to engage in the process. The economic chamber was the most active in providing comments on indicators because this chamber had more resources to be engaged in the process when compared with the other three chambers.

> *I think the social chamber had one person that carried the ball through most of the process. Similarly, the Aboriginal chamber had one strong representative who was essential to the process. The industry had strong representation and strong interest throughout.* A representative of the SDG.

The degree of perceived flexibility of future forest management under the new standard was also a key factor in promoting the ability of the SDG to find consensus without resorting to partisan positions. One of the starting points in the negotiation process on biodiversity indicators was on how to increase the stringency of biodiversity conservation requirements while not pushing forest companies out of the FSC system.

> *That was the big thing. How to push, to maximize, conservation gains but not break the FSC tool by forcing companies to leave the system.* An SDG member.

By exploring different ways to maintain the flexibility of forest management, the SDG was thereby able to sidestep one of the concerns of the economic chamber. Such efforts of the SDG led FSC-Canada to adopt a consensus-based, holistic approach focused on landscape management for the development of the new biodiversity-related indicators, based on regional gap-analysis to estimate how much and what type of habitats should be set aside. This approach was perceived to foster a continued flexibility in forest management while also aiding the economic chamber to understand what was expected regarding the implementation of IFLs, a key sticking point.

> *A lot of the work that went into the standard was around balancing, providing direction without being overly prescriptive, and not setting up how to do things in order to get to an end result and allowing flexibility for cultural differences, and company differences and different situations on the forest, different starting points.* A representative of the SDG.

Another key factor contributing to perceived flexibility of forest management under the new standard was the development of three main management options on the maintenance and protection of caribou in the new standard. This factor provoked the most intense discussions among chambers. According to interview data, the increasing relocation of forestry operations performed by private forest companies to the northern parts of Canada, where mature boreal forests were the primary resource base for logging, was perceived by some stakeholders to threaten further deterioration of woodland caribou habitats, the majority of which were also located in the north. The main discussions were therefore on how to maintain the intactness of boreal forests needed for caribou while maintaining timber production and socioeconomic benefits for local and Indigenous communities.

> *The next 20 years are critical for the woodland caribou in the northern boreal forests and that is where mature forests are until you can go back to the southern forests where managed forests will be mature again.* A representative of FSC-Canada.

However, some respondents also claimed that such efforts of the SDG to increase the flexibility of forest management and minimize the prescriptiveness sometimes collided with FSC-International's desire to strengthen regional and international consistency of FSC standards. This led to conflicts between FSC-Canada and FSC-International, e.g., discussions related to new IGIs (6.5.5) requiring that "conservation area networks comprise a minimum 10% area of the Management Unit" (FSC 2015*b*). These conflicts were perceived by respondents to decrease the overall efficiency and efficacy of the standard-development process.

> [Our approach] *had several considerations that needed to be considered in identifying protected areas for the landscape - what is it in your landscape, what is in the surrounding landscape, what are the national and international obligations of Canada? So, the Policy and Standard Committee said that this was good, but we need to have at least 10%... It has affected the integrity of how we want to include biodiversity considerations...FSC-International is very much set on a numeric of 10% represented in the forest management unit. Whereas we are less concerned about the exact number rather than what's happening both within, as well as around, the forest management unit.* A representative of the SDG.

Such interference by FSC-International, as perceived by respondents, decreased the overall efficiency and efficacy of the standard-development process, and led to frustration among participants and other stakeholders with outcomes, which in turn had an impact on the ability of the SDG to find a consensus.

> *FSC-International didn't understand the Canadian context... They asked for several changes that weakened the standard. They are more concerned about having international consistency than a good product in Canada.* A representative of the SDG.

The availability, accessibility, and adequacy of scientific and technical expertise and data relating to the maintenance and protection of biodiversity was also identified as a key factor underpinning dynamics in the action situation. The existence and/or development of this broadly respected body of knowledge was a key factor in ensuring the ability of chambers to find consensus without resorting to partisan positions. Several underlying factors contributed to this knowledge, including the investment of unpaid time and effort by volunteer members; the skills, knowledge, and devotion of people in the standard-development process; and the adequacy and timeliness of stakeholder outreach efforts. Regarding the latter, two public consultations were organized, in line with FSC procedures.

> *We had a lot of comments coming from government, associations like local municipal associations, from the four chambers, from outside Canada, especially from the US.* A representative of FSC-Canada.

Additionally, many regional workshops with diverse groups of stakeholders and webinars were conducted to bring knowledge and expertise from outside and to aid understanding regarding how different indicators might be accepted and implemented by stakeholders. Stakeholder outreach was crucial to the perceived legitimacy and adequacy of the standard. Additionally, 23 desk and field tests were conducted, including 2 field tests of the entire standard, to systematically and objectively evaluate the practicality and implementation of proposed biodiversity-related indicators.

Exogenous factors

Although multiple exogenous factors were identified in the Canadian case (see Appendix 7), the network analysis (see Appendix 4) did not identify any of these as key factors.

Outcomes

Respondents linked multiple action-situation processes to both tangible and intangible outcomes. Regarding tangible outcomes, the majority of biodiversity-related IGIs were adapted, whereas few IGIs were dropped or adopted verbatim (Appendix 8). Intangible outcomes were perceived differently by different respondents. Those who were relatively positive about the standard acknowledged that the efforts of the SDG to increase flexibility and minimize prescriptiveness of the indicators improved the perceived ease and auditability of new biodiversity-related indicators, which in turn was linked to both greater perceived adequacy of the standard as well as increased attractiveness of FSC certification for forest companies. The innovative procedures and approaches adopted by FSC-Canada, which aimed more at biodiversity conservation using a holistic landscape approach, were a key factor influencing the satisfaction of stakeholders with the process and its outcomes, which in turn was perceived to influence the legitimacy of the standard. However, some participants were concerned that the standard would not be practicable, due to its relatively high number of indicators and the addition of many new requirements, and that certificate holders might decide to leave the FSC system. Others found the process to be arduous and time-consuming, "just an incredible amount of work for volunteer folks." However, despite its various efforts, the SDG was unable to find consensus on indicators related to protection, conservation, and management of IFLs. Respondents commented that FSC-International's desire to strengthen regional/international consistency of FSC standards led to a continuous stream of newly developed IGIs and requirements throughout the standard-development process, including the late introduction of IGIs on IFLs (in 2017), which left the SDG without adequate time to operationalize and integrated IFLs into the standard. This impeded the economic chamber's ability to understand what was expected of them regarding IFLs.

> *A lot of people in the economic chamber are very disappointed with not being able to know what is expected from them with regard to IFLs. This is a big showstopper.* A representative of the SDG.

Additionally, a request was made by the Aboriginal chamber to integrate IFLs with the concept of Indigenous cultural landscapes (ICL) because many IFLs are used by Indigenous communities for their traditional activities such as hunting, fishing, and wild food/medicine gathering. Thus, any decision on IFLs would need to be made through the Free, Prior and Informed Consent (FPIC) filter. The concept of ICL was under development and was not included in the new FSC standard either. The resulting delays and disagreements concerning how to integrate these concepts were considered by respondents to impede the ability of the SDG to find consensus without resorting to partisan positions.

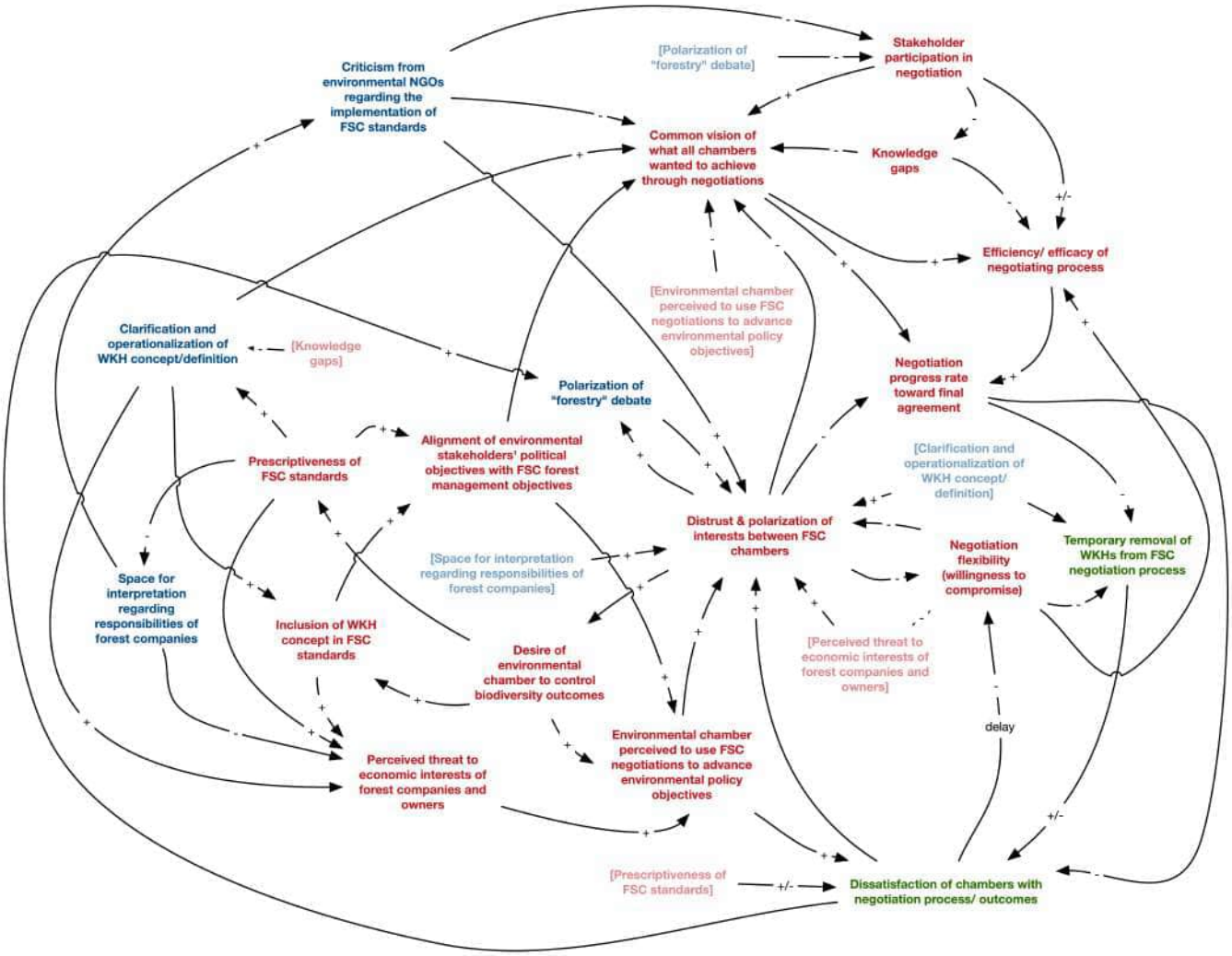
Sweden

Action situation

Distrust and polarization of interests between chambers was one of the most structurally important factors (see Fig. 2; Appendix 7) identified among the causal dynamics of the Swedish standard-development process. This key factor underscored a growing desire of the environmental chamber to control biodiversity outcomes by, for example, seeking to increase the prescriptiveness of the FSC standard. Respondents commented that growing criticism from environmental NGOs regarding the biodiversity outcomes of FSC-certified forest management had led the environmental chamber to lose trust in the forestry sector's willingness to honors its commitments to protect biodiversity. The environmental chamber therefore now wanted to prescribe every detail in the standard, in effect reducing the standard's space for interpretation regarding the responsibilities of forest companies, while the economic chamber was arguing for a more flexible and adaptive approach to biodiversity issues in forest-management operations. Respondents confirmed that heated debates regarding the prescriptiveness of biodiversity indicators were underscored by the deep distrust between chambers.

> *The standard is very detailed that you must do exactly this. And in many cases that is a result of the NGOs not*

Fig. 2. A causal network diagram of the key factors underpinning the dynamics of the standard-development process in Sweden. Arrows connecting drivers indicate the influence of a given factor on multiple processes within and between the action situation (red), exogenous factors (blue), and outcomes (green). Appendix 7 presents the causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors, and outcomes in Sweden. Note: FSC = Forest Standards Council; WKH = woodland key habitat.



trusting the certified companies to let them make their own decisions. A representative of the SDG.

One of the main arguments against increased prescriptiveness was that the standard is telling what to do or not to do, but not to what it should lead to, i.e., not about performance targets. A representative of the economic chamber.

The desire of the environmental chamber to control biodiversity outcomes was also identified to influence the inclusion of the WKH concept in the FSC standards negotiations, which influenced the degree to which the standard-development process was perceived to threaten the economic interests of forest companies and forest owners. The initial negotiating positions of each chamber were characterized by a low willingness to compromise, which reinforced the distrust and polarization between chambers and ultimately led to a stall in the negotiation progress rate. As a result, chambers eventually agreed to temporarily remove the WKHs from the negotiations process. However, this solution led to increased dissatisfaction with the negotiation process and outcomes from the environmental chamber, further fueling feedback loops leading to distrust and polarization between the chambers. Beyond the WKH issue, respondents commented that FSC-International's desire to harmonize global standards had led to IGIs that were so broadly formulated that it created difficulties for their interpretation and adaptation to the Swedish context. In one example provided, IGIs mandated an increased threshold of set asides for biodiversity conservation to 10% of productive forests. This triggered a heated

discussion among chambers regarding the potentially unfair impact of this IGI on the economic interests of the large proportion of small-scale forest owners in Sweden. Consensus could not be reached on this indicator and approval of the standard was therefore postponed.

Respondents commented that a common vision of what all chambers wanted to achieve through FSC certification, i.e., regarding what responsible forest management is about, how FSC could contribute to achieving it, and the role of FSC in biodiversity conservation, was crucial to the negotiation progress rate toward the final agreement on biodiversity indicators. However, such a common vision was absent due to the increasing distrust and polarization between FSC chambers, but also due to the unrealistic expectations of stakeholders. "Each chamber had big expectations that FSC would provide solutions to all issues," said a representative of the SDG. The lack of a common vision led chambers to shift the focus of discussions from essential matters to technical details, which respondents said reduced the efficiency and efficacy of the negotiation process, creating negotiation fatigue among those involved and slowing progress toward an agreed standard.

Stakeholder participation in the standard-development process was identified to influence the negotiation progress rate toward the final agreement on biodiversity indicators via a number of indirect pathways (Fig. 2; Appendix 7). Respondents stated that the participation of a diverse range of stakeholders aided in filling knowledge gaps, which improved the common understanding of biodiversity indicators and redressed unrealistic expectations, while also reducing the difficulty for interpreting and adapting the IGIs to the Swedish context and thereby improving the overall efficiency and efficacy of the negotiating process. However, chambers differed from each other in terms of the heterogeneity and number of participating stakeholders. The economic chamber was the most heterogeneous, representing stakeholders from many branches related to the forestry sector. The social chamber was also heterogenous but relatively small, while the environmental chamber was both homogenous and small. The diversity and size of each chamber had an inverse impact on their ability to formulate a clear agenda with clearly assigned responsibilities to representatives, and thereby on the overall efficiency and efficacy of the negotiating process (Appendix 7). For instance, respondents commented that only the environmental chamber had a clear and concrete agenda regarding what they wanted to achieve during the negotiations. The economic chamber, on the other hand, was said to lack an agreed agenda, which created challenges in later negotiation phases.

> *We had a vision that we tried to implement in the standards negotiation process. I did not see this from the economic chamber.* A representative of the SDG.

Exogenous factors

Several key exogenous factors were identified as influencing both action situation dynamics and outcomes of the standard-development process. In addition to the broader polarization of the "forestry" debate in Sweden, which reflected a breadth of opinions regarding the expected role of forests in national climate-change adaptation strategies, including the national forestry sector's perception that they already are environmentally responsible, another key exogenous factor related to the clarification and operationalization of the WKH concept. The main disagreements during the standard-development process regarded the meaning of this concept and its inclusion in the new standard, which blocked the negotiation process for a period of time. The WKH concept was considered controversial by the economic chamber, which claimed that it was not supported by national legislation and that there was insufficient knowledge regarding how to define and operationalize it. A representative of the economic chamber stated that when the concept of WKH was first formulated, it was agreed that only up to 2% of forests would be set-aside as the WKHs. This was accepted by the forestry stakeholders, and the concept was thereby included into the current national standard. However, the definition of the WKHs was later broadened and concretized. It led to a higher share of forests being potentially designated as WKHs, especially in the northern part of Sweden where forestry operations had intensified, thus strengthening the perceived threat to economic interests of forest companies and owners, and consequently fueling distrust and polarization of interests among chambers. One of the underlying drivers of this debate on the WKH, according to the representative of the environmental chamber, was the vagueness of national environmental and forest legislation (see Appendix 7), which was perceived to give too much space for interpretation of the responsibilities of forest companies with regard to biodiversity conservation. In part, the WKH debate was also said to be driven by increasing competition among global certification bodies, which were perceived as driving demands to increase the legitimacy and credibility of FSC and thereby the inclusion of new concepts for biodiversity protection in the standard-development process. Due to the high level of disagreement, the WKH concept was temporally removed from the FSC negotiation process to decrease polarization between chambers, increase the willingness to compromise, and thereby to enable negotiations to progress toward a final agreement regarding the content of the new standard as a whole.

Outcomes

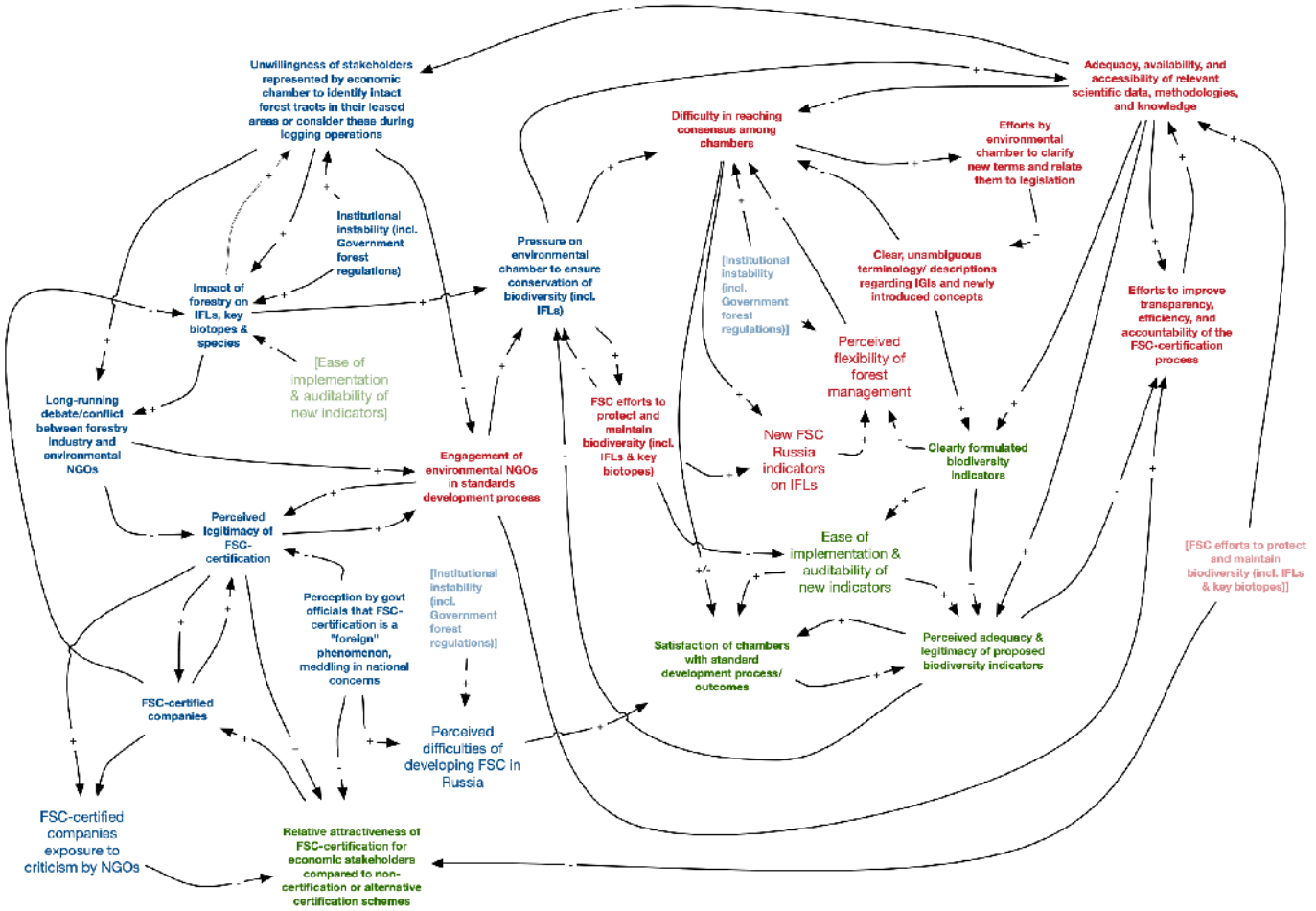
In terms of tangible outcomes, many biodiversity-related IGIs were dropped in the agreed version and many new biodiversity-related indicators were introduced (Appendix 8). The WKH concept was dropped, and it was decided that negotiations regarding WKHs would continue when (1) the Forest Agency finalized a WKH inventory to know how much forested land should be designated as the WKH, and (2) the WKH concept was sufficiently clarified and operationalized by the responsible stakeholders.

In terms of intangible outcomes, all respondents expressed dissatisfaction with the negotiation processes and its outcomes. The standard-development process was perceived to be long, inefficient, and frustrating.

> *We are not satisfied with the process. The outcomes may be the best that we could get; however, we have a long list of things that could be done better.* A representative of the SDG.

Respondents from the economic chamber commented that although the environmental chamber's desire for greater controls

Fig. 3. A causal network diagram of the key factors underpinning the dynamics of the standard-development process in Russia. Arrows connecting drivers indicate the influence of a given factor on multiple processes within and between the action situation (red), exogenous factors (blue), and outcomes (green). Appendix 8 presents the causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors, and outcomes in Russia. Note: IFL = intact forest landscapes; FSC = Forest Standards Council; IGI = international generic indicators.



on biodiversity had led to an increased prescriptiveness of the FSC standard related to biodiversity issues, it had also stymied the development of a set of relevant economic indicators.

> *Indicators regarding how to perform responsible forestry, including better economic results, are very few.* A representative of the SDG.

All respondents claimed that distrust and polarization between chambers had increased to the extent that:

> *everybody is frustrated, negative, mistrustful within the FSC-Sweden. We have come to the point where we do not like each other anymore.* A representative of SDG.

Given that individual negotiators tended to be influenced by events in previous rounds of negotiations (see Appendix 7), some respondents feared that future negotiations may prove even more difficult.

Russia

Action situation

The causal network analysis indicated the difficulty in reaching consensus among chambers as one of the most structurally important factors (see Fig. 3; Appendix 9) characterizing the standard-development process in Russia. Many key factors were identified as contributing to this difficulty, including via multiple balancing feedback dynamics, through which this difficulty was slowly mediated and resolved. One key driver in this respect was the pressure on the environmental chamber to ensure conservation of biodiversity, which respondents said was primarily a response of environmental stakeholders to the growing impact of forestry on IFLs, key biotopes, and species, and partly also to the perceived inadequacy of FSC efforts to protect and maintain biodiversity in prior iterations of the standard. The more the environmental chamber felt that the fate of biodiversity in Russian forests was solely upon their shoulders, the greater the difficulty in reaching consensus among chambers. At the same time, the pressure on the

environmental chamber was also said to drive a number of action-situation dynamics that eventually mitigated this difficulty. For example, it led to the development of several new efforts to protect and maintain biodiversity including a new set of indicators on IFLs. These new indicators were perceived by respondents to offer greater flexibility of forest management, thereby disarming a central conflict.

Importantly, pressure on the environmental chamber was described as a key factor driving the adequacy, availability, and accessibility of relevant scientific data, methodologies, and knowledge, which in turn were both key factors for eventually mitigating the difficulty in reaching consensus among chambers as well as influencing several other key dynamics of the standard-development process. Lack of correct/updated data related to biodiversity, especially on the distribution of high conservation values (HCV) in FSC-certified forests, IFLs, intact forest tracts, and key biotopes, was perceived as a crucial missing attribute in early negotiations between chambers on biodiversity issues. For example, there was no complete information on the distribution of some categories of HCVs in some regions. Additionally, an initial lack of clear methodologies on specific biodiversity indicators, e.g., intact forest tracts, had contributed to an unwillingness of economic stakeholders to identify intact forest tracts in their leased areas. Forest companies appeared broadly suspicious of new biodiversity issues, complaining that they were "invented by ecologists to extort money" from economic stakeholders and that there was too much "room for expert assessments, for the human factor, for lobbying, for certain scientific views that are not, perhaps, generally accepted," a representative of FSC board.

Such unwillingness was influenced by the degree to which companies leased forests consisting of intact forest tracts, i.e., companies feared that FSC restrictions on logging in these areas would threaten their profitability, driving them to drop FSC. At the same time, the engagement of environmental NGOs in the standard-development process was identified as a key factor influencing the development of efforts to improve transparency, efficiency, and accountability of the FSC-certification process, which in turn contributed to the adequacy, availability, and accessibility of relevant scientific data, methodologies, and knowledge. For example, environmental NGOs were credited with developing a comprehensive open database regarding key biotopes and HCVFs to support the negotiation process. Another key factor that caused initial difficulty in reaching consensus among chambers was the lack of clear, unambiguous terminology regarding IGIs and other newly introduced concepts. Although some respondents suggested that IGIs provided more or less clear directions on how to address new P&C introduced by FSC-International, several respondents commented that IGIs were unclear. Along with other new terms related to biodiversity (e.g., environmental values), unclear IGIs triggered debates among and within chambers as to how they could be adapted to the Russian context, as well as necessitating frequent interactions between FSC-Russia and FSC-International to clarify concepts and definitions. The repetition of some biodiversity-related IGIs, for example, on the protection of rare ecosystems, in both principles 6 and 9 was also said to create challenges. These activities slowed down the negotiation process.

> *The previous Russian FSC standard was criticized by the economic chamber and auditors for being too complicated, but with IGIs, a whole new set of indicators appeared, which makes the standard even more complicated in terms of its understanding and implementation.* A representative of the SDG.

> *During the last 10 years, we had used specific biodiversity terms, and suddenly new terms were introduced with IGIs. For example, we spent much time to understand and agree on what 'environmental values' means and how to operationalize it.* A representative of the SDG.

However, these difficulties led to a series of efforts by the environmental chamber to clarify new terms and relate them to the Russian legislation as well as to field testing of specific indicators. Such efforts were crucial to enable consensus between chambers, leading to a final set of clearly formulated biodiversity indicators that were perceived to be relatively easier to implement and audit, while maintaining a desired level of flexibility in forest management.

Exogenous factors

Several interconnected exogenous variables were identified as key factors influencing action situation dynamics. Respondents identified various direct and indirect impacts that a more general institutional instability (including related to government forest regulations) had on the standard-development process in Russia. Unpredictable and frequently changing forestry institutions increased uncertainty surrounding adequacy of national legislation to protect biodiversity and the degree to which legislation overlapped with FSC standards as they developed over time. Unstable forestry institutions contributed to uncertainty surrounding leasing rights in IFLs and the extent to which economic stakeholders were forced to harvest all allowable cut in IFLs, which in turn was a key source of long-running conflict between forest companies and environmental NGOs regarding biodiversity conservation in Russia. Such conflicts had slowly undermined the perceived legitimacy of FSC certification, which in turn negatively impacted the engagement of environmental NGOs in the standard-development process. There were many debates and conflicts among private forest companies and environmental NGOs in Russia regarding the protection of IFLs, many of which are not legally protected and are often the only remaining areas with sufficient timber resources for logging. Some respondents blamed the FSC system in general, and particularly FSC-Russia, for its inability to stop logging of IFLs.

> *Now, when we define IFLs according to the new standard, we open access to these landscapes under the umbrella of all kinds of forestry operations. No clear regulations exist on what and how to harvest in such forests. Thus, all requirements on IFLs are rather declarative.* A representative of the SDG.

According to respondents, the perceived legitimacy of FSC certification in Russia was also undermined by the perception by government officials that FSC certification was a foreign phenomenon meddling in national concerns, which was said to contribute to a generally negative image of FSC in Russian media. Together with institutional instability, this perception was identified as a key factor underlying a set of special difficulties in

developing FSC in Russia. Respondents also commented that there was an attempt to introduce a parallel national certification system in Russia as an alternative to FSC forest-certification schemes.

> *FSC-Russia has challenges now. Some companies are leaving; the FSC system is criticized on radio and TV.* A representative of the environmental chamber.

Respondents also mentioned that the general public's relative ignorance regarding forests and forestry issues was exploited by some actors, e.g., through social media, to manipulate public opinions on forestry and forest companies. Such dynamics were said to cement the negative media image of FSC and to have influenced the behavior of some stakeholders during the negotiation process. The perceived legitimacy of FSC certification was also said to be undermined by a lack of real differences in biodiversity outcomes on the ground between FSC-certified and non-certified forest companies. An underlying concern of some environmental stakeholders in this regard was the perception that FSC-International was trying to expand the area under certification globally and was thereby pushing FSC-Russia to relax certification requirements, with many certified companies not living up to their commitments.

> *The differences between FSC-certified and non-certified forest management exist only on paper. There are responsible forest companies that are trying to do their best, and there are also companies that do as little as possible and are using forest certification only to get access to the market.* A representative of the SDG.

Outcomes

In terms of tangible outcomes, the majority of IGIs relating to biodiversity indicators in both Principle 6 and 9 were adapted (Appendix 8). Adequate knowledge/data were key factors in the development of clearly formulated biodiversity indicators. For example, a comprehensive list of key biotopes with their key attributes and management requirements was developed during the standard-development process, providing clear guidance on how to identify and manage such biotopes. Several respondents commented that available data were much better during this revision of the standard, compared with negotiations for the previous standard.

Respondents perceived the ultimate adequacy and legitimacy of agreed biodiversity indicators differently. Some respondents felt that the standard was good with clearly formulated biodiversity indicators, which promoted the ease of implementation and auditability of new indicators.

> *It is absolutely clear that this standard is a step forward... It is probably good that the standard is moving forward in one or two small steps, rather than one giant leap.* A representative of the SDG.

Respondents commented that the standard now contained new important biodiversity-related issues, which were supported by relevant scientific data and knowledge. Examples related to: (1) a list of environmental forest values that forestry enterprises should maintain, which was elaborated and included into the standard; (2) activities on restoration of natural values that were lost following past forestry operations; and (3) the ecosystem approach to identify representative forest ecosystems that should be maintained. Other stakeholders claimed that the new standard was less demanding and contained unclear biodiversity indicators without any thresholds. Still others claimed that the new standard was even more complicated and difficult to implement/audit that the previous one, with a high a number of biodiversity indicators that would make FSC certification less attractive for forest companies compared to non-certification or alternative-certification systems. Several respondents claimed that FSC certification would not be able to stop logging in IFLs and that several new biodiversity indicators would not work due to (1) absence of data needed to identify/check the location of forests with high biodiversity values, and (2) a lack of specialists that had capacity and knowledge to audit certain biodiversity indicators (e.g., on connectivity).

DISCUSSION

Our research demonstrates that despite ongoing efforts of FSC-International to harmonize FSC standards across all countries, there are multiple factors that influence how biodiversity-related IGIs have been integrated in different ways in different national FSC standards. We identified common clusters of key endogenous and exogenous factors that triggered and shaped the core dynamics of the standard-setting processes across the three countries: Canada, Sweden, and Russia.

Key endogenous factors

Among endogenous factors (i.e., within action situations), we determined four clusters of key factors, relating to (1) practices, (2) biodiversity-related indicators and concepts, (3) desired level of control over biodiversity-related outcomes, and (4) adequacy of available scientific information and knowledge about the state and status of biodiversity (Table 3).

Practices

Several key practices of translation (Berger and Esguerra 2018) that were introduced, developed, and applied by chambers were crucial to adjust biodiversity-related IGIs to local contexts. Following Pouliot (2016) and considering the context of this study, practices described pattern of interactions among different chambers during a standard-setting process that are embedded in a particular organized context. Important practices included creating space for discussions, improvements in the transparency, efficiency and accountability of the FSC-certification process, and building consensus around contested issues (see Table 3). Such practices were used by stakeholders to encourage and support dialogue and seek consensus during negotiations, which shaped interactions between negotiation participants and thereby directly and indirectly influencing negotiation processes and outcomes. These "consensus seeking" practices (Balzarova and Castka 2012) included efforts made by chambers to allow for a more flexible interpretation of biodiversity-related IGIs in national FSC standards. For example, the Canadian SDG's efforts to increase the flexibility of forest management by adopting a consensus-based, holistic approach focused on landscape management principles was perceived to increase the efficiency and efficacy of the standard-development process, which led to greater satisfaction of stakeholders with the process and outcomes. Despite causing some conflict with FSC-International, this approach was shown to have multiple positive impacts on the

Table 3. Clusters of key factors, i.e., exogenous and endogenous, which triggered the core dynamics of standard-development processes across three countries: Canada, Sweden, and Russia.

Clusters of key factors	Canada	Sweden	Russia
Exogenous factors:			
Forest governance		Criticism from environmental NGOs regarding the implementation of Forest Standards Council (FSC) standards Polarization of "forestry" debate	Perception by state officials that FSC certification is a "foreign" phenomenon Long-running debate/conflict between forestry industry and environmental NGOs Perceived legitimacy of FSC-certification system Pressure on environmental chamber to ensure conservation of biodiversity (incl. intact forest landscapes or IFLs) Institutional instability (incl. Government forest regulations)
Legislation		Space for interpretation regarding responsibilities of forest companies Clarification and operationalization of woodland key habitat (WKH) concept	
Endogenous factors: Practices			
	Operational drafting of standard undertaken by staff and consultants, with input from technical experts Ability of chambers to find consensus around contested issues without resorting to partisan positions Efforts of SDG (What does this stand for?) to increase flexibility/minimize prescriptiveness FSC-Canada's development of innovative procedures for standard negotiations Adequacy and timeliness of stakeholder outreach efforts	Environmental chamber uses FSC negotiations to advance environmental policy objectives Alignment of environmental stakeholders' political objectives with FSC forest-management objectives Distrust and polarization of sectoral interests between FSC chambers	Efforts by environmental chamber to clarify new terms and relate them to legislation Efforts to improve transparency, efficiency, and accountability of the FSC-certification process Engagement of environmental NGOs in the standard-development process
Biodiversity-related indicators and concepts	Indigenous cultural landscapes (ICL) concept under development FSC-Canada adopts a consensus-based, holistic landscape approach to development of biodiversity targets Perceived flexibility of forest management under new standard Development of indicators to integrate IFL concept with the concept of ICL Development of three main management options for caribou	Inclusion of WKH concept in FSC standards	Clear, unambiguous terminology/descriptions regarding IGIs and newly introduced concepts
Desired level of control over outcomes	Conflict between FSC-Canada and FSC-International FSC International's desire to strengthen regional/international consistency of FSC standards	Desire of environmental chamber to control biodiversity outcomes Prescriptiveness of FSC standards	FSC efforts to protect and maintain biodiversity (incl. IFLs and key biotopes)
Available scientific information and knowledge	Availability, accessibility, and adequacy of relevant scientific, cultural, and technical expertise and data	Knowledge gaps	Adequacy, availability, and accessibility of relevant scientific data, methodologies, and knowledge

ability of chambers to find consensus around contested biodiversity-related issues without resorting to partisan positions. We argue that consensus-seeking practices with diverse trust-building processes appear to play a key facilitating role in negotiations on biodiversity conservation in production forests, in which trust has typically been eroded over time due to the increasing pressure of intensified forestry on biodiversity and in which the onus for investment is lopsided. Our results align with several previous studies, confirming the critical role of trust to shift conflicting interests toward joint actions in overcoming highly contested collective action problems (Ostrom 2005, 2010, Rothstein 2005, Nysten-Haarala and Tysiachniouk 2013, Patterson 2016, Hotte et al. 2019).

Our study identified that FSC standard-setting processes were prone to "negotiation fatigue." In our cases, negotiations took five to seven years. This led to negotiation fatigue, which constrained the satisfaction of participants with negotiation

processes and outcomes. The development of multi-stakeholder standards as collective-choice rules is a collaborative process of mutual learning, adjustment, and relation-building (Ostrom 2005). Much time is needed to achieve consensus on complex issues such as biodiversity-related indicators, especially when new indicators are introduced. However, our findings in this regard suggest that either negotiation complexity might be more adequately delimited according to reasonable time constraints, or negotiation participants might adjust their expectations regarding how long negotiations may reasonably take to conclude. As our results show, the efficiency and efficacy of negotiations influenced the ability to find consensus on contested issues, as well as influencing the degree to which stakeholders were satisfied with negotiation processes and outcomes. Avoiding negotiation fatigue is therefore not a trivial matter. In addition, Patterson (2016) claimed that unrealistic expectations regarding the time needed to undertake a collaborative process may have implications for the availability of the resources required to participate in the process, staffing requirements, data availability, and dedication to the stakeholder-focused process.

To improve the efficiency of standard-setting processes, FSC national boards introduced practices of "re-configuration" to help chambers reach consensus on the most contested issues. For example, core groups of two-three representatives per chamber were established to translate biodiversity-related IGIs into national FSC standards. In the Canadian case, this occurred at the beginning of the standard-development process. In Sweden and Russia, this only occurred after negotiations involving large groups of participants failed to progress to agreement. This finding raises a question regarding the trade-offs between inclusivity and efficiency of standard-setting processes. How inclusive and participatory should they be? Sinner et al. (2015) showed that negotiations involving a smaller, select group of members may be more successful in terms of achieving consensus, but less successful in managing conflict away from the negotiating table. Given that our results show the impact of broader, long-term debates regarding forestry and biodiversity on negotiations, the management of conflicts away from the negotiating table cannot be ignored. Further research is needed to understand how to better balance FSC standards negotiations to enhance negotiation efficiency without jeopardizing the legitimacy of outcomes.

Additionally, our results show that ongoing amendments to policies and instructions from FSC-International, ostensibly to improve translation of IGIs into the national FSC standards, in reality increased the degree to which IGIs were contested between chambers, which constrained and prolonged negotiation processes at the national level in all three countries. We therefore argue that improved coordination between stakeholders at different FSC governance levels is crucial to foster mutual learning and relation building, for example, by improving the flexibility of links between FSC levels (through, e.g., development of social networks) to better balance top-down and bottom-up influences (e.g., Olsson et al. 2007).

Biodiversity-related indicators and concepts

The second cluster of key factors concerns the set of biodiversity-related actions (see Ostrom 2005) linked to forest management activities. These factors shaped how respective chambers perceived the adequacy and legitimacy of emerging negotiation outcomes, feeding back into negotiation processes themselves. Across cases, various sets of biodiversity-related indicators and concepts were proposed by FSC-International (e.g., IGIs) and by chambers (e.g., WKH, ICLs) during the standard-setting process. In this regard, our study shows the importance of developing and issuing clear and unambiguous sets of indicators and concepts by those who are involved, directly or indirectly, in negotiation processes, which otherwise risk becoming unnecessarily contested regarding their interpretation and integrity, leading to negotiation fatigue and other undesirable outcomes. In a context of studies on transnational governances (e.g., Berger and Esguerra 2018), our findings show that when IGIs "traveled," the meanings of some IGIs have changed as they change their political and social contexts, and new biodiversity-related indicators have been introduced that are relevant for a particular context. In this respect, sufficiently available, accessible, and reliable data and knowledge appear to be an important factor for reducing opposition by economic stakeholders to proposed actions that are perceived to increase costs.

Desired level of control over outcomes

The third cluster of key endogenous factors relates to the level of control that stakeholders are perceived to desire over biodiversity-related outcomes. Our findings indicate that even when predefined rules concerning the balance of power between negotiation actors exist, some participants may nevertheless be perceived by others as attempting to wrest control over outcomes. Such perceptions, whether true or not, exert a key influence on interactions within the action situation. For example, environmental chambers in Sweden were perceived by economic stakeholders to be engaged in a campaign to increase the prescriptiveness and level of strictness of biodiversity indicators, as a result of broader, long-running societal debates regarding the negative impacts of forestry on biodiversity and the erosion of trust and growing antagonism between environmentalists and the forestry industry. This perception fed a growing distrust and polarization between chambers, with concomitant difficulty in achieving consensus. Such interactions among standard setters correspond to practices of contestation (Bartley 2021, Graz 2021) that aims at "rejecting standards or changing them so radically that power imbalances between actors could be inverted" (Graz 2021:5). Literature shows that practices of contestation could delegitimize standards by running aground upon local opposition (Graz 2021, Wood 2021).

By contrast, and despite similar exogenous drivers, FSC-Canada's consensus-based holistic landscape approach appeared to defuse these practices by focusing on developing biodiversity indicators while retaining a degree of flexibility in forest management. Our findings here touch on the importance of balancing the need for enough prescription to assure stakeholders that biodiversity values are being protected with enough flexibility to gain wide-spread stakeholder support and accommodate contextual differences (Klooster 2010). This again implies the importance of a careful negotiation process design and management, which acknowledges exogenous factors and seeks novel ways to establish common ground and a united purpose for negotiators. In this respect, the management of perceptions that chambers develop regarding each other's motivations and respective commitment to achieving mutually acceptable negotiated outcomes is perhaps crucial.

Available scientific information and knowledge

Finally, the fourth cluster of endogenous key factors relates to available scientific information and knowledge about the state and status of biodiversity. Our findings across the three countries highlight that contested issues are more adequately presented, explored, and resolved when adequate scientific data and knowledge are made available to all participants during the negotiation process. In our cases, the availability of such knowledge was shown to increase the willingness of participants to compromise and thereby to enhance the efficiency and efficacy of negotiation processes. When participants were faced with incomplete or insufficient information to resolve a contested issue, negotiation processes failed or were postponed. This occurred in the identification and management of the WKHs in Sweden and the operationalization of ICLs in Canada. The importance of comprehensive and accessible scientific knowledge (knowledge power) in addressing complex problems of biodiversity conservation is highlighted by other scholars (van Noordwijk et al. 2001, Christie 2008, Opdam et al. 2008, Do Thi et al. 2017). However, as Gulbrandsen (2004, 2008) noted, scientific information may be either excluded or harnessed selectively by strong economic actors to serve their interests in the negotiating process. This means that even if comprehensive ecological knowledge might be introduced as a part of the negotiation process leading to a standard, there is no guarantee that it will be used (Angelstam et al. 2013). This problem may be ameliorated by facilitating co-production of knowledge among scientific experts, practitioners, and decision makers, albeit with potentially important ramifications for additional time and other resource requirements.

Key exogenous factors

Action situations, such as FSC standard-setting processes, are influenced by a broader set of exogenous factors related to attributes of the wider social-ecological contexts in which they are situated (Ostrom 2010). In this regard, our results support previous findings (e.g., Bartley 2021, Graz 2021), which identify transnational standards as socially and historically constructed phenomena that become embedded "in local structures at firm and farm level, and in their direct environment in the community and domestic governance institutions" (Graz 2021:3). Bartley (2021) identified that local contexts, including institutions, are important in understanding challenges and limitations in implementation of transnational private governance. We identified a common cluster of key exogenous contextual factors that challenged the process of translation of biodiversity-related IGIs into the national FSC standards.

Forest governance

Factors related to forest governance in Sweden and Russia were shown to constrain the emergence of a consensual, satisfactory negotiation process. Several key governance factors were related to an increasingly polarized societal context surrounding intensive forest management and the legitimacy of FSC certification as an institution. Both Sweden and Russia have witnessed heated debates among relevant stakeholders regarding if, and to what extent, FSC certification contributes to biodiversity conservation in production forests. The polarizing effect of these debates influenced the environment for negotiations by reducing the overall willingness to find amenable compromises on biodiversity issues during the standard-development processes.

It should be mentioned that data from the Canadian case study also revealed several similar exogenous factors regarding the impact of a broader societal debate on forestry's impact on biodiversity. However, interview narratives of Canadian respondents focused more on the endogenous processes they had developed to overcome such dynamics.

Legislation

Beyond a generally polarized "forestry" debate, we identified a number of context-specific institutional factors. For example, the legal context related to biodiversity conservation in Sweden was shown to contribute to two key exogenous factors: (1) it provided much space for diverse interpretations regarding the responsibilities of forest companies concerning biodiversity conservation and (2) failed to provide a much-needed legal clarification to allow the WKH concept to be operationalized in alignment with current legislation. Both of these factors had a further critical impact on the polarization of interests among chambers. In Russia, institutional instability surrounding the management of forest resources was one of the key context-specific governance factors. This was related to the continuous transformation of forestry and environmental legislation, changes of key responsible officials in the governmental organizations, etc.

CONCLUSIONS

Taken together, the results of this study suggest that efforts to enhance the performance of forest certification for biodiversity conservation need to be considered in light of the complex nature of negotiation processes. Negotiation processes are widely used in voluntary, market-based certification schemes to set up rules regulating natural resource use. However, there is limited insight into the factors shaping these negotiation processes and their outcomes regarding environmental problems. Applying the IAD framework with a complex systems approach improves understanding concerning the interdependent social-ecological dynamics that influence the formulation of collective-choice rules related to biodiversity conservation in different economic, ecological, and political contexts. Negotiation outcomes are emergent products resulting from iterative interactions between multiple exogenous and endogenous factors, involving stakeholders with various behaviors, norms, views, and agendas, and mirror national and regional contexts (Cotell and Davis 2000, Keskitalo et al. 2009). This study illustrates how negotiation processes related to forest biodiversity conservation navigate the diversity of conflicting interests connected to forests.

The results highlight the importance of developing effective process-focused instruments to support constructive interactions between chambers and to defuse or redirect antagonistic situations. In this vein, the engagement of professionals, who have both skills in conflict resolutions and knowledge in biodiversity issues, to participate in and coordinate negotiation processes may also prove a useful innovation (Christie 2008). However, further empirical research is needed to investigate factors and their causal linkages at multiple levels influencing success and failure of negotiations regarding biodiversity conservation to improve environmental governance. Finally, biodiversity conservation is one of the United Nations' sustainable development goals and forest certification is a potentially useful instrument to fulfill this goal, especially in contexts where state-based instruments are unwelcome, insufficient, or unsuitable. However, considerable

evidence shows that conservation and sustainable use of biodiversity outside of protected areas would benefit from embedding biodiversity considerations into policies, strategies, and practices of private and public actors that impact or rely on biodiversity (IPBES 2018). We would argue that employing a diversity of strategies to mainstream the conservation and sustainable use of biodiversity in different sectors would help create a more favorable societal context to increase forest certification performance.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12778

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Data Availability:

I agree that all relevant data and code underlying the findings described in my manuscript are fully available.

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Appendix 1. Interview protocol.

Please, introduce yourself?

What is your position within the FSC process?

What were the main stages of the FSC negotiation process? How did the standard-setting process work? What were the steps?

How did the standard-setting process work? How were the members of the SDG and TG selected? What were the steps? [Key informants]

What issues received the most attention? Why?
Among stakeholders?
Among the SDG?

How were they IGIs communicated from FSC? [How did you first learn of them?]
What instructions were given about how to integrate the IGIs?

What was the role of FSC international in this process? How active a role did they play?

What was the stakeholder response to the indicators? [*At each distinct stage, i.e. all forums of negotiation and in the public review process*]

How did you approach working with the IGIs? [*We want to know what the response was at the national level as well as the technicalities of how they organized themselves*.]

What were the formal and informal forums used to gain input and reach decisions on the indicators? Sub-committees? Sponsored workshops? Field testing? Public review process? Who was involved? (including beyond the SDG and Technical groups) [*Trying to get at forums of negotiation beyond just formal FSC processes, mapping them out, timeline*]

How would you describe the balance of participation in the standards development processes? Who was most active? Who was missing? Were there groups who chose not to participate? Were there voices absent or insufficiently considered in the process

What were the key issues that came up in relation to biodiversity?

How were the IGIs initially received?

How well were the IGIs adapted to [your country] context?

What were the formal and informal forums used to gain input and reach decisions on the indicators? Sub-committees? Sponsored workshops? Field testing? Who was involved? (including beyond the SDG and Technical groups) [*Trying to get at forums of negotiation beyond just formal FSC processes, mapping them out, timeline*]

Were there other, broader political, social and economic issues, including changes to legal requirements, changes in the markets, political developments, other certification systems that influenced the indicator development process for biodiversity?

Among external actors? [probe about who they are (including government, industry, civil society, indigenous) and interview them]

What was the response to the indicators? [*At each distinct stage, i.e. all forums of negotiation and in the public review process*]

How were different perspectives addressed?

Can you describe the [*power*] dynamics among the chambers in regards to biodiversity and the participants in the process generally? [Who had what position?]

Was consensus reached on the final indicators? [SDG, other interested parties]

How satisfied were you with the process?
[Likert scale 0-5. 0 not at all satisfied; 5 very satisfied]

How satisfied were you with the final indicators?

From your perspective, were there interested parties who were dissatisfied with the process and/or indicators?

What were the key differences between this standards development process and the previous process [*including composition and influence of stakeholders*]? [Or are there any differences that you think are significant between this standards development process and the previous process?]

What were the key differences between the treatment of biodiversity in this standard and the previous standard?

How would you describe the direction FSC is going? Would you like to see any changes?

Appendix 2. The causal network data of each case was analyzed using several network statistics, which together were used to develop an index to indicate the relative structural importance of a given node (coded factor) based on its structural properties. Adapted and extended from McGlashan et al. (2016), based on the work of Eden (2004), Oliva (2004), Koschützki et al. (2005), Costa et al. (2007), Gonzales and Parrott (2012), and Clauset (2019).

Metric	Definition	Structural importance for causal networks
Degree	The total number of edges leading to and from a given node.	Indicates the extent to which a given factor directly influences/ is influenced by other factors. The greater the number of unique causal arguments attributed during interviews to a factor, the greater the degree of the node, and therefore the more important it is considered as a driver and/or mediator of causal influence throughout the network.
Betweenness centrality	The number of shortest paths between any two nodes of the network that passes through the given node.	Indicates bridging effect of given factor, i.e. the ability to connect different clusters of causal arguments in the network. Factors with high betweenness centrality potentially mediate the flow of indirect influence between many other factors.
Eigenvector centrality	The influence of a node in a network, accounting for the relative importance of its neighbouring nodes.	A factor with high eigenvector centrality is considered to be structurally important due to its relative causal proximity to other important factors, i.e. connections to other high-scoring nodes.
Loop count	The number of unique, closed feedback loops that a given variable participates in.	Feedback is a central concept in complex systems theory, particularly in emergent system dynamics. A given factor that participates in multiple feedback loops is therefore considered to exert more potential leverage on system dynamics and is therefore considered more structurally important than a variable that participates in few or no loops.

Appendix 3. Network analysis metrics used to identify structurally important factors in the Canadian FSC standard development process. Bold indicates key factors, based on these metrics.

Label	Degree	Betweenesscentrality	Eigencentrality	Loop count
Ability of chambers to find consensus without resorting to partisan positions	22	843,695238	1	526
Ability of SDG to listen, find solutions, and act as a team	4	21,333333	0,055536	106
Acceptance of IGI concept amongst experts	3	18	0,017435	0
Adequacy and timeliness of stakeholder outreach efforts	4	0	0	0
Adequacy of standard	8	77,97619	0,537769	151
Adequate time to operationalise and integrate IFL concept into standard	4	31,866667	0,070979	141
Ambiguity of IGIs formulated by FSC International	4	8	0,003618	0
Attractiveness of FSC for forest companies	5	261,535714	0,390581	489
Availability of prior model for negotiating cooperative conservation agreement	1	0	0	0
Availability, accessibility and adequacy of accepted scientific, cultural and technical expertise and data	11	294,202381	0,208418	261
Available resources/ capacities of a given chamber for negotiations	3	8	0,116798	1
Broader societal debate regarding impact of forestry on biodiversity and indigenous people	4	46,8	0,019268	0
Conflict between FSC-Canada and FSC-International	6	123,833333	0,122597	322
Constitutional protection of traditional land use rights of Aboriginal peoples	2	0	0	0
Continuous development of new IGIs and requirements by FSC International throughout standard development process	3	6,75	0,003618	0
Desk and field testing of key topics	2	0	0,085644	1
Development of indicators to integrate IFL concept with the concept of Indigenous Cultural Landscapes	5	160,983333	0,161112	142
Development of three main management options for caribou during standard negotiations	6	98,154762	0,464485	129
Diversity of stakeholders involved in the standard development process	2	0	0	0
Dual mission of Technical Expert Panels to balance biodiversity conservation with economic viability of forestry	2	0	0	0
Economic chamber understand what is expected of them regarding implementation of IFLs	5	45,533333	0,061736	253
Efficiency/ efficacy of standard negotiation process	14	641,464286	0,600238	486
Efforts of SDG to increase flexibility/ minimise prescriptiveness	4	235,535714	0,131854	489
Federal Government Strategy on Caribou Recovery	3	19,066667	0,007629	0
Flexibility of incorporating IGIs into national standard (adopt, adapt, drop) to promote fit with Canadian context	3	7,5	0,007629	0
Forest companies are solely responsible for	2	0	0	0

implementation of standard				
FSC International's desire to strengthen regional/international consistency of FSC standards	5	0	0	0
FSC-Canada adopts consensus-based, holistic approach focused on landscape management for development of new biodiversity targets	9	231,435714	0,162612	361
FSC-Canada's development of innovative procedures for standard negotiations	5	228,392857	0,22273	157
FSC-International focused on quantitative biodiversity targets per specific forest management unit (e.g. 10% set-asides)	1	0	0	0
ICL concept under development	3	113,333333	0,373438	142
IFL concept integrated into new standard	4	11,833333	0,417612	2
IGIs developed as a calibrating tool across FSC regions/ nations	3	3,75	0,003618	0
Impact of forestry, resource exploration, road building, and other human activity on Caribou and indigenous people	2	0	0	0
Integration of comments into new standard	3	0,5	0,003618	0
Investment of unpaid time and effort by volunteer members	6	300,619048	0,309968	278
Lack of conformance regarding implementation of caribou indicators of previous FSC standard	2	0	0	0
Lack of experience of forest companies with landscape perspective	3	26,666667	0,06688	114
Legitimacy of new standard	8	193,469048	0,743666	362
Livelihood benefits from forests for local and indigenous communities in northern Canada	6	37,716667	0,007236	0
New standard perceived as innovative	2	1,833333	0,06688	44
Operational drafting of standard undertaken by staff and consultants (not SDG), with input from technical experts	4	82,5	0,076521	86
Perceived ease of implementation & auditability of new standard/ indicators	6	66,483333	0,06251	141
Perceived flexibility of forest management under new standard	5	130,133333	0,283323	219
Perceived negative impact of standard on stakeholders represented by economic chamber	4	17	0,003618	0
Perception that FSC international interfered with development of final standard, sometimes in opposition to FSC Canada	3	2,5	0,003618	0
Pressure from Federal Govt to integrate aspects of legislation into standard	1	0	0	0
Proposed indicators concerning Caribou, IFLs, and protected area networks	3	15,483333	0,007629	0
Request from Aboriginal chamber to resolve issues on identification, conservation, or protection of IFL	5	21,25	0,025064	0
SDG able to focus on most complex and contested issues	3	11,25	0,027768	17
Size of SDG	3	27	0,076521	54
Skills, knowledge and devotion of people in standard development process	5	39,5	0,112787	147
Stakeholders' satisfaction with process and/or outcomes	9	102,47619	0,685928	283
Standard development process perceived as technical exercise rather than a negotiation	3	0	0,365417	72
Stringency of biodiversity conservation	5	100,359524	0,117037	190

requirements (e.g. Number/ prescriptiveness of indicators)				
Trust amongst environmental chamber in forest companies to self-regulate impact on caribou habitats	3	14,083333	0,021791	0
Woodland Caribou as threatened, flagship species	4	20,2	0,003618	0

Appendix 4. Network analysis metrics used to identify structurally important factors in the Swedish FSC standard development process. Bold indicates key factors, based on these metrics.

Factor	Degree	Betweenesscentrality	Eigencentrality	Loop Count
Absence of WKH concept in national legislation	1	0	0	0
Active, knowledgeable members mandated to represent each chamber in core group	3	0	0,212191	1
Alignment of environmental stakeholders' political objectives with FSC forest management objectives	5	20,921429	0,140676	176
Available resources/ capacities of different stakeholders in chamber	3	0	0	0
Broader societal debate regarding climate change mitigation/adaptation strategies	2	0	0	0
Clarification and operationalisation of WKH concept/definition	8	177,935714	0,114369	540
Clearly formulated agenda of chamber, with clearly assigned responsibilities to representatives	4	36	0,073562	72
Common understanding of biodiversity indicators in negotiations between FSC chambers	5	12,166667	0,494677	152
Common vision of what all chambers wanted to achieve through negotiations	8	120,935714	0,793568	572
Competition among global certification bodies	2	0	0	0
Concerns that small-scale forest owners will be forced to leave FSC	3	6,966667	0,038967	35
Criticism from environmental NGOs regarding the implementation of FSC standards	4	62	0,040023	215
Demands of global market to increase credibility of FSC	5	21,30119	0,003735	0
Desire of environmental chamber to control biodiversity outcomes	4	495,983333	0,373493	616
Difficulty for interpretation and adaptation of IGIs to concrete context	5	55,666667	0,069601	24
Dissatisfaction of chambers with negotiation process/ outcomes	7	502,141667	0,5664	879
Distrust & polarisation of interests between FSC chambers	15	853,715476	1	866
Efficiency/ efficacy of negotiating process	9	283,45	0,541452	443
Environmental chamber perceived to use FSC negotiations to advance environmental policy objectives	6	98,871429	0,329823	400
Forested areas designated as WKHs	4	25,677381	0,070811	161
Formal & informal consultation processes	3	49	0,049558	25
FSC certification provides important access to markets	1	0	0	0
FSC international desire to harmonise standards towards improved performance	4	21,865476	0,01226	0
Heterogeneous composition of chamber	2	24	0,088842	36
Historical evolution of FSC	0	0	0	0

IGIs propose significant increase in threshold of existing biodiversity indicators (e.g. set-asides)	5	39,19881	0,016308	0
Inclusion of WKH concept in FSC standards	4	51,833333	0,187432	347
Knowledge gaps	6	246,516667	0,113894	521
Lack of interaction between FSC International and FSC Sweden	1	0	0	0
Mismatch between IGIs and national legislation	4	84,444048	0,062286	114
Negotiation flexibility (willingness to compromise)	7	114,269048	0,591744	384
Negotiation progress rate towards final agreement	5	381,109524	0,871598	750
Number of prescriptive indicators to maintain ecological and social functions of forests	3	95,5	0,052551	106
Perceived risk of undesired/ no outcome of negotiation	2	35	0,003735	0
Perceived threat to economic interests of forest companies and owners	11	240,405952	0,27533	472
Perceived unfair impact on small-scale forest owners	3	10,279762	0,015724	0
Perception among economic chamber representatives that previous Swedish biodiversity requirements were stronger than many other national FSC standards	1	0	0	0
Perception among economic chamber that new standard is more prescriptive/ restrictive than IGIs	4	28,033333	0,02466	71
Perception amongst Swedish forestry industry that they are environmentally responsible	3	70	0,01226	0
Polarisation of "forestry" debate	6	428,516667	0,582894	596
Prescriptiveness of FSC standards	7	367,338095	0,137407	484
Relative lack of indicators concerning development of economic results for responsible forestry	2	9,704762	0,131152	61
Shift of discussion focus from essential things to technical details	3	10,166667	0,331482	298
Size of chamber (number of representatives)	3	34	0,088842	48
Societal/policy expectations that Swedish forest-based bioeconomy will deliver important outcomes for climate mitigation/adaptation	2	1	0,003735	0
Space for intepretation regarding responsibilities of forest companies	6	127,22381	0,07201	251
Stakeholder participation in negotiation	6	392,683333	0,233522	604
Temporary removal of WKHs from FSC negotiation process	5	48,344048	0,580992	432
Tendency of individual negotiators to dwell on previous defeats	2	12,666667	0,189358	181
Unfinished WKH inventory	2	0	0	0
Unrealistic expectations among stakeholders regarding utility of FSC	2	5,166667	0,025052	24

certification				
Vagueness of national environmental/forest legislation	2	0	0	0

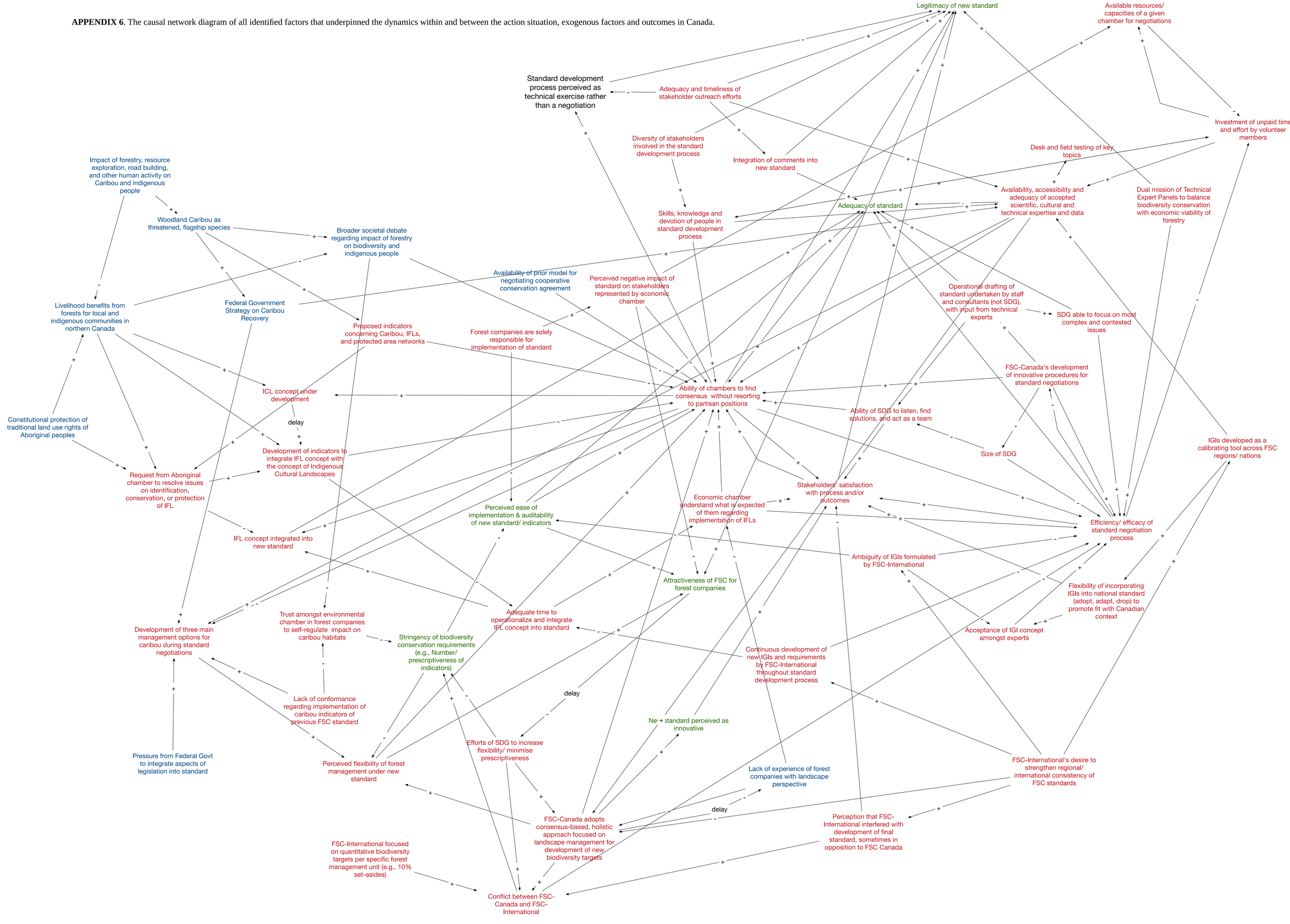
Appendix 5. Network analysis metrics used to identify structurally important factors in the Russian FSC standard development process. Bold indicates key factors, based on these metrics.

Factor	Degree	Betweenesscentrality	Eigencentrality	Loop Count
Adequacy of national legislation to protect biodiversity	5	10,083333	0,004015	0
Adequacy, availability and accessibility of relevant scientific data, methodologies and knowledge	11	476,233333	0,695968	867
Capability of participants to negotiate/ moderate negotiations	1	0	0	0
Clear, unambiguous terminology/ descriptions regarding IGIs and newly-introduced concepts	7	202,666667	0,202729	427
Clearly formulated biodiversity indicators	5	140,475	0,338051	397
Development of process-focused indicators, rather than outcome-focused	1	0	0	0
Difficulty in reaching consensus among chambers	12	376,583333	0,759392	660
Ease of implementation & auditability of new indicators	6	116,016667	0,151772	306
Efficiency/ efficacy of negotiation process	4	34	0,3148	117
Efforts by environmental chamber to clarify new terms and relate them to legislation	2	180,666667	0,306771	425
Efforts to improve transparency, efficiency, and accountability of the FSC-certification process	4	203,033333	0,809728	758
Engagement of environmental NGOs in standards negotiations	6	493,358333	0,51169	689
Environmentally responsible forestry	3	133,816667	0,275669	581
Experts contribute to standards development on voluntary basis	2	0	0	0
Field-testing of biodiversity indicators	3	24,025	0,087776	118
FSC certification provides access to markets for certified timber	2	0	0,004015	0
FSC efforts to protect and maintain biodiversity (incl. IFLs & key biotopes)	4	203,616667	0,224662	587
FSC-certified companies	5	279,083333	0,518102	631
FSC-certified companies exposure to criticism by NGOs	4	13,583333	0,509839	147
Greenpeace Russia shape public opinion against current forest management	5	34	0,004015	0
Impact of forestry on IFLs, key biotopes & species	7	160,483333	0,262312	735
Inadequate knowledge of general public about forests and forestry	1	0	0	0
Institutional instability (incl. Government forest regulations)	4	0	0	0
Integration of comments from stakeholders into new standard	1	0	0	0
Interactions between FSC-International and FSC-Russia	2	0	0,087776	1
Introduction of new, Russian national certification system	3	7,75	0,307749	122

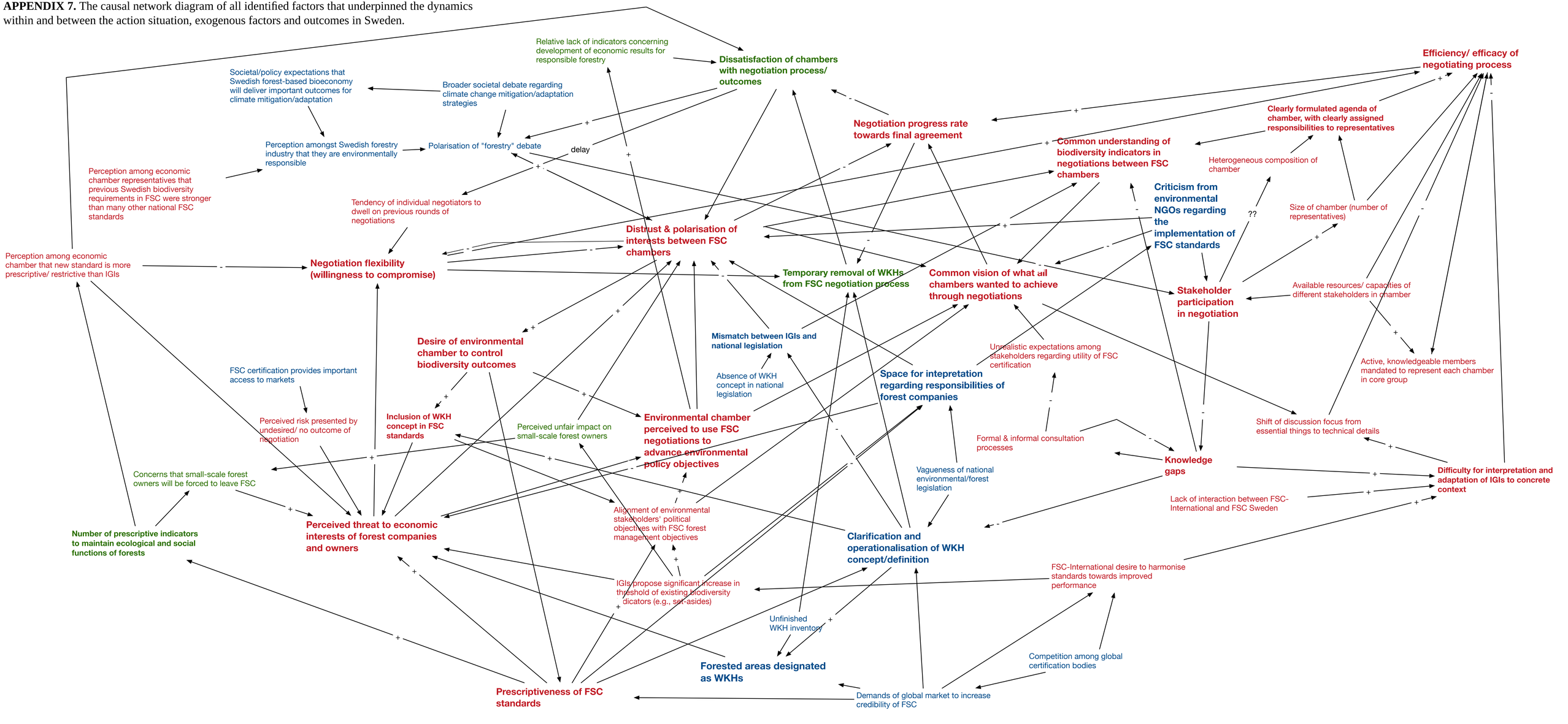
Investment made by large stakeholders represented by economic chamber for FSC-certification	2	0	0	0
Lack of specialists that had capacity and knowledge to fulfill/check requirements of certain biodiversity indicators	1	0	0	0
Leasing rights to log in intact forests	7	131,166667	0,215634	565
Lobbying by large stakeholders represented by economic chamber	1	0	0	0
Long-running debate/conflict between forestry industry and environmental NGOs	5	153,25	0,231339	508
Multiple stakeholder consultations on draft standard	1	0	0	0
Negative media image of FSC	5	24	0,510562	26
New FSC Russia indicators on IFLs	3	26,166667	0,389452	217
New standard considered even more complicated and difficult to implement/ audit than previous standard	2	3,333333	0,03441	72
Number of requirements on biodiversity in new standard compared with old standard	5	135,033333	0,082681	317
Overlap/ synergy between FSC standard and national legislation (e.g. Concerning biodiversity protection)	5	144,733333	0,103858	375
Participation of chambers at domestic and international meetings outside of negotiation process	3	151,15	0,250275	376
Perceived adequacy & legitimacy of proposed biodiversity indicators	11	500,816667	0,901024	790
Perceived desire of FSC-International to expand area under certification	1	0	0	0
Perceived difficulties of developing FSC in Russia	4	39,75	0,012044	0
Perceived flexibility of forest management	5	40,666667	0,287727	263
Perceived legitimacy of FSC-certification	14	572,283333	0,741941	663
Perception by environmental NGOs that certification is given too easily, with many certified companies NOT living up to requirements	3	56,908333	0,114142	186
Perception by forest companies that FSC certification will protect them from environmental criticism	2	6,75	0,303734	122
Perception by govt officials that FSC-certification is a "foreign" phenomenon, meddling in national concerns	4	0	0	0
Pressure on environmental chamber to ensure conservation of biodiversity (incl. IFLs)	6	706,233333	0,593862	857
Proximity of forest areas to less environmentally-sensitive markets	2	0	0	0
Relative attractiveness of FSC-certification for economic stakeholders compared to non-certification or alternative certification schemes	10	231,45	0,501584	509
Satisfaction of chambers with negotiation process/ outcomes	8	234,083333	1	388

Share of forest lease potentially identifiable as intact forest tract	1	0	0	0
Stakeholders represented by economic chamber fears of losing profitability	4	34	0,004015	0
Stakeholders represented by economic chamber forced to harvest all AAC	4	4,583333	0,004015	0
State ownership of forests	1	0	0	0
Stringency of biodiversity prescriptions in alternative certification schemes	1	0	0	0
Unwillingness of stakeholders represented by economic chamber to identify intact forest tracts in their leased areas or consider these during logging operations	5	115,166667	0,481614	565

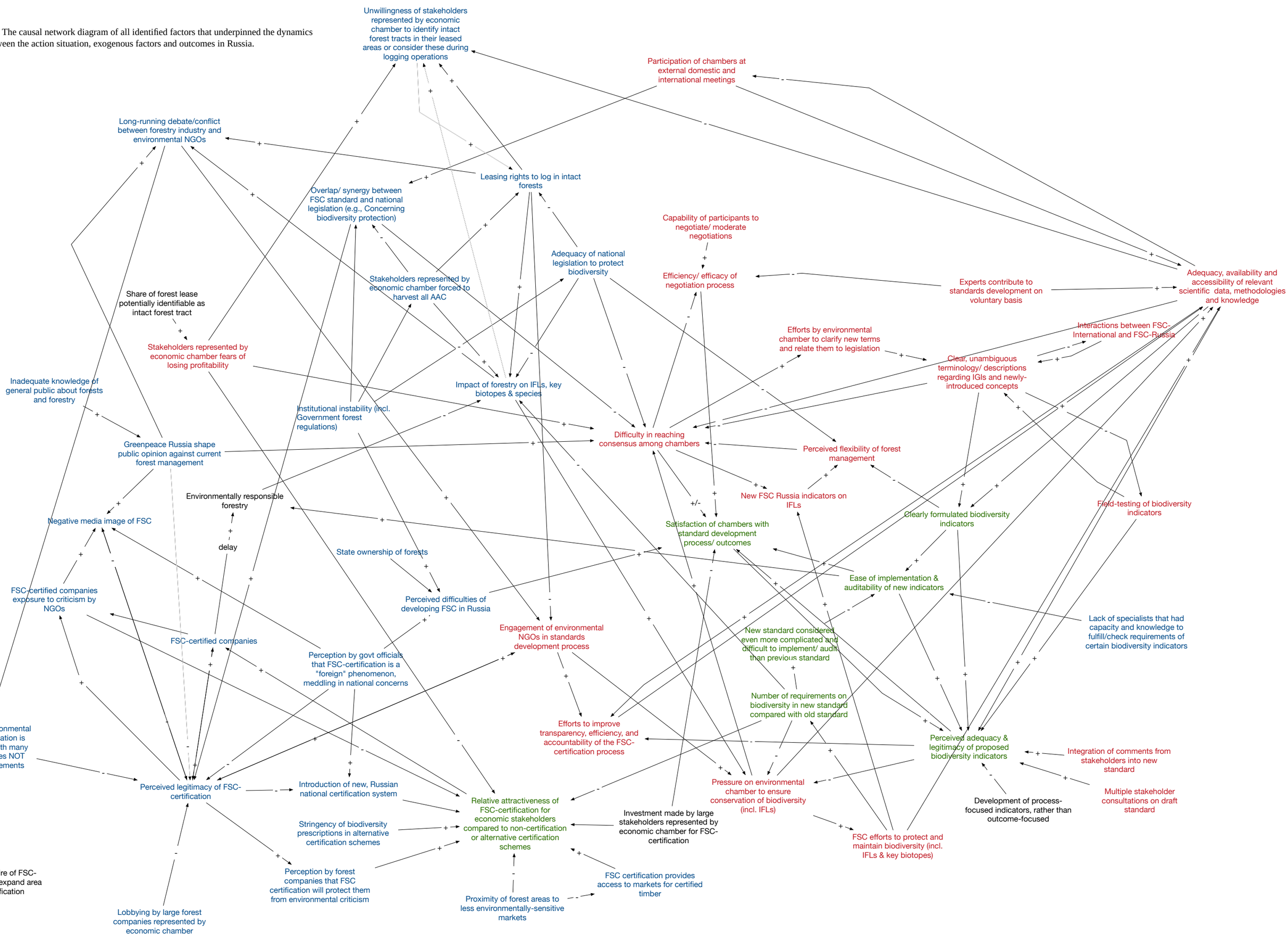
APPENDIX 6. The causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors and outcomes in Canada.



APPENDIX 7. The causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors and outcomes in Sweden.



Appendix 8. Numbers of biodiversity-related IGIs and added indicators in Principle 6 and Principle 9 in the revised national FSC standards as outcomes of the standard development processes in Canada, Sweden and Russia.

	Adopted	Adapted	Dropped	Added
Principle 6				
Canada	1	24	4	16
Sweden	0	8	21	50
Russia	3	23	3	
Principle 9				
Canada	2	12	5	6
Sweden	0	9	10	2
Russia	1	14	4	3

APPENDIX 9. The causal network diagram of all identified factors that underpinned the dynamics within and between the action situation, exogenous factors and outcomes in Russia.