

# Monitoring and Information Reporting through Regulation: An Inter-Jurisdictional Comparison of Forestry-Related Hard Laws

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In most jurisdictions, the rule of law has been the core instrument used to implement rules, regulations and restrictions relating to forests. The results of this approach have relied on the effectiveness of the system for regulating through monitoring and reporting. Despite the obvious differences in the wider operating environment of forestry internationally, issues related to globalization have increased the need for comparison. The potential impact of certain social, economic and environmental differences on the nature of monitoring and information reporting is, therefore, important to forest policy and management. The analysis presented here considered data associated with forestry-related monitoring and information reporting to provide a comparative description of certain hard-law requirements in a sample of jurisdictions. This was done to shed light on the potential for coordinated monitoring and information reporting objectives to be mandated through inter-jurisdictional hard law. Our research suggests that further comparative analysis of hard law monitoring and information reporting requirements could form a central theme in defining the ‘ground rules’ of a global forest law.

**Keywords** forest legislation, grounded theory, constant comparison, Europe, North America

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# 1 Introduction

In most jurisdictions, the rule of law has been the core instrument used to implement rules, regulations and restrictions relating to forests (Cirelli and Schmithusen 2000, Lane and McDonald 2002, Meidinger 2003, Hickey 2004a). The results of this approach have relied on the effectiveness of the system for regulating through monitoring and reporting<sup>1</sup> (Development Law Service 2001, Fingleton 2002, McKay and Moeller 2002).

Lubbers (2003) defined hard law as agreements on principles with a high degree of legal security based on a constitution and ratified by parliament (see also Shelton 2000, Abbott et al. 2001, Hickey 2004a). Alternatively, 'soft law' is defined as agreements on principles with low levels of legal security that often reflect ethical conceptions not yet documented in hard law (Lubbers 2003, Abbott et al. 2001). While a range of soft law<sup>2</sup> initiatives have now emerged to monitor sustainable forest management (SFM) performance at various scales, hard law regulation retains the advantage of being universally applicable within a particular jurisdiction, thereby enabling a level of standardization in the data being collected (McKay and Moeller 2002, Hickey 2004a). Further, as soft law is voluntary, only hard laws provide for criminal and civil penalties (Dicus and Delfino 2003).

According to Bauer et al. (2004), international agreements have had a significant impact on national forest laws in terms of better recognizing the need for a more integrative approach to forest ecosystem and landscape management. In 2000, the Food and Agriculture Organization (FAO) noted the following trend in forestry related hard laws:

*"Increasingly, such laws reflect the growing worldwide push towards more consideration of non-timber values of forests, such as biodiversity functions, sustainability concerns and social interests. The general trend has been towards broadening management objectives, strengthening environmental measures and assessments, improving planning tools, promoting local and private forestry, and increasing opportunities for public participation in forest management."*

While this is a positive evolution, there are

few studies that have analyzed the monitoring and information-reporting requirements documented in forestry-related hard laws in different jurisdictions. This is most likely due to the complex jurisdictional conditions that surround the enforcement of hard laws and regulations [see Tarasofsky 1999, Ellefson and Hibbard (2003), Cashore and McDermott (2004), Bauer et al. (2004)].

It has been recognized that a typical 'western' society will suffer from the exploitation of common resources [i.e. "the tragedy of the commons" (see Hardin 1968)] without a suitable regulatory framework. This has been a strong point of consideration by forest stakeholders over time and has driven the development of legislation designed to monitor the sustainability of natural resource harvesting within their jurisdiction. When considering the regulations associated with environmental protection in democratic societies, Godden (1997) noted that environmental values are culturally relative and that the legal system will often reinforce these views (Hickey 2004a). As a result, forestry laws need to fit into a jurisdiction's social, economic and environmental setting.

The potential impact of certain social, economic and environmental differences on the nature of monitoring and information reporting is important to SFM. Despite the obvious differences in the wider operating environment of forestry in different jurisdictions, the increased impact of globalization and the emergence of transnational social movements have resulted in a demand for international comparison, particularly in terms of forest policy and regulation [e.g. the UNCED 'Statement of Principles on Forests' (1992)] (Bernstein and Cashore 2000, Hickey and Innes 2005). Further, Brunnee and Nollkaemper (1996) noted that the various 'layers' of international dialogue designed to address different aspects of forest management are promoting a gradual convergence of expectations and interests that may further normative development. While there have been clear improvements in international efforts to develop legal agreements related to SFM, the process has not been smooth. In 1998, the World Commission on Forests and Sustainable Development stated:

*"... there is a crisis of credibility given the*

*myriad [of] international legal agreements that await serious implementation, which could bring significant dividends to forests, and given that the global compact based on one earth, one world, a common future envisaged in the Earth Summit, is far from being a political reality.*" (Tarasofsky 1999).

There are many challenges associated with analyzing SFM-related phenomena in an international context. This paper represents a 'first step' towards gaining a better understanding of inter-jurisdictional monitoring and information reporting for SFM through hard law regulation. It presents the results of an exploratory analysis designed to compare the monitoring and information-reporting requirements documented in a purposive sample of forestry-related hard law standards from Europe and North America. The research aimed to provide a grounded perspective from which to consider the potential for coordinated monitoring and information reporting objectives to be mandated through inter-jurisdictional hard law. The study is based on data presented in Hickey (2004b).

## 2 Methods

Our analysis focused on specific objectives, outputs and discussion related to monitoring and information reporting in forestry. The hard law standards were obtained from recognized sources of legal documentation. The main sources for legislation were the FAO database, FAOLEX, (<http://faolex.fao.org/faolex/>) and the European Forest Institute (EFI) ([www.efi.fi/efidas](http://www.efi.fi/efidas)). Every effort was made to obtain the most recent documentation to enable a relevant interpretation of the hard law requirements in the selected jurisdictions.

### 2.1 Jurisdictions and Documentation

The study concentrated on a purposive sample of OECD member countries located in North America and Europe (see Table 1) to ensure a level of similarity in the social, economic and environmental conditions that relate to forest management [see Hickey (2004b) for full rationale]. This enabled a meaningful comparison of forestry-

**Table 1.** General forest statistics for selected jurisdictions.

Jurisdiction	Land area (1000 ha)	Population density (n/km <sup>2</sup> )	Rural population (%)	Forest and woodland area (%)	Forest area per capita (ha)	Publicly owned forest (%)
Alberta (Canada)	64232 <sup>a)</sup>	4.8 <sup>a)</sup>	32.9 <sup>b)</sup>	59.5 <sup>a)</sup>	12.3 <sup>a)</sup>	96 <sup>c)</sup>
BC (Canada)	92519 <sup>a)</sup>	4.5 <sup>a)</sup>	40.8 <sup>b)</sup>	65.5 <sup>a)</sup>	14.6 <sup>a)</sup>	96 <sup>c)</sup>
Ontario (Canada)	91774 <sup>a)</sup>	13.1 <sup>a)</sup>	19.4 <sup>b)</sup>	63.2 <sup>a)</sup>	4.8 <sup>a)</sup>	89 <sup>c)</sup>
California (USA)	40397 <sup>d)</sup>	83.8 <sup>e)</sup>	3.3 <sup>f)</sup>	40.3 <sup>g)</sup>	0.5 <sup>e)</sup>	58 <sup>g)</sup>
Maine (USA)	7994 <sup>d)</sup>	15.9 <sup>e)</sup>	59.8 <sup>f)</sup>	89.6 <sup>g)</sup>	5.6 <sup>e)</sup>	6 <sup>g)</sup>
Minnesota (USA)	20621 <sup>d)</sup>	23.9 <sup>e)</sup>	29.2 <sup>f)</sup>	32.7 <sup>g)</sup>	1.4 <sup>e)</sup>	56 <sup>g)</sup>
Czech Republic	7728 <sup>h)</sup>	132.8 <sup>h)</sup>	33.9 <sup>h)</sup>	34.1 <sup>h)</sup>	0.3 <sup>h)</sup>	84 <sup>i)</sup>
Denmark	4243 <sup>h)</sup>	124.5 <sup>h)</sup>	14.4 <sup>h)</sup>	10.7 <sup>h)</sup>	0.1 <sup>h)</sup>	31 <sup>i)</sup>
Finland	30459 <sup>h)</sup>	17 <sup>h)</sup>	35.4 <sup>h)</sup>	72 <sup>h)</sup>	4.2 <sup>h)</sup>	29 <sup>i)</sup>
Norway	30683 <sup>h)</sup>	14.5 <sup>h)</sup>	26 <sup>h)</sup>	28.9 <sup>h)</sup>	2 <sup>h)</sup>	14 <sup>i)</sup>
Sweden	41162 <sup>h)</sup>	21.6 <sup>h)</sup>	16.7 <sup>h)</sup>	65.9 <sup>h)</sup>	3.1 <sup>h)</sup>	17 <sup>i)</sup>
United Kingdom	24160 <sup>h)</sup>	244.1 <sup>h)</sup>	10.7 <sup>h)</sup>	11.6 <sup>h)</sup>	0 <sup>h)</sup>	43 <sup>i)</sup>

<sup>a)</sup> 2002 Statistics Canada (<http://www.statcan.ca/english/Pgdb/>)

<sup>b)</sup> 2001 Canadian Rural Partnership, Government of Canada ([www.rural.gc.ca](http://www.rural.gc.ca))

<sup>c)</sup> 1991 Canadian Council of Forest Ministers (CCFM) national database ([www.nfdp.cfm.org](http://www.nfdp.cfm.org))

<sup>d)</sup> 1990 United States Census Bureau ([http://www.census.gov/population/censusdata/90den\\_stco.txt](http://www.census.gov/population/censusdata/90den_stco.txt))

<sup>e)</sup> 2000 United States Census Bureau (<http://quickfacts.census.gov/qfd/>)

<sup>f)</sup> 2002 Economic Research Service, United States Department of Agriculture (USDA) ([www.ers.usda.gov](http://www.ers.usda.gov))

<sup>g)</sup> 2002 USDA Forest Service RPA Forest Resource Assessment Tables (<http://ncrs2.fs.fed.us/4801/fiadb/index.htm>)

<sup>h)</sup> 2000 Global Forest Resources Assessment (<http://www.unece.org/trade/timber/fra/welcome.htm>)

<sup>i)</sup> 2000 Temperate and Boreal Forest Resources Assessment (<http://www.unece.org/trade/timber/fra/welcome.htm>)

**Table 2.** Selected hard law documentation from Europe and North America.

a) European forestry laws	
1996	Czech Republic Act on Forests and Amendments to some Acts
1996	Denmark Forest Law
1996	Finland Forest Act
1994	Great Britain Forestry and Afforestation Act (1967)
1997	Act relating to Forestry and the Protection of Forests (1965) Norway
1994	Sweden Forestry Act
b) North American forestry laws	
1971	Alberta Forests Act
1993	Alberta Forest and Prairie Protection Act
2003	Z'berg-Nejedly Forest Practice Act (California)
2004	British Columbia's Forest and Range Practices Act
2003	Maine Code of Forestry
1995	Minnesota Sustainable Forest Resources Act 89A
2004	Minnesota State Forests; Tree Planting; Forest Roads Act 89
1994	Ontario Crown Forest Sustainability Act 1994
1990	Ontario Forestry Act
1990	Ontario Forest Fires Prevention Act

related monitoring and information reporting requirements between jurisdictions. The European jurisdictions considered for analysis were limited to those with hard law documentation that was available in the English language. In the case of USA and Canada, a purposive sample of states and provinces were selected.

To explore the nature of the hard laws in the selected jurisdictions, the predominant forestry-related legislation from 12 jurisdictions were analyzed (see Table 2). In most cases this involved a single document (e.g., Forest Practice Act); however, in a few cases a limited number of interlinked and inter-dependant documents were analyzed.

The documents were reviewed and the information requirements extracted. The analysis presented in this paper covered not only the information required for annual reporting, but all of the information required or implied to meet the legislation.

Annex 1 presents a list of the environment-related legislation that has been adopted in the selected jurisdictions. It shows that each jurisdiction has many different hard law standards that are either directly or indirectly related to forestry. This is relevant to SFM because both the breadth of the hard law standards and specific requirements documented in the relevant legislation determine the nature of monitoring and information reporting conducted by forest managers through time.

The following methodology was also used to conduct a comparative analysis of forestry-related soft law standards from Europe and North America (see Hickey et al. 2006).

## 2.2 Qualitative Analysis

The grounded theory approach was the prominent research paradigm used for this study (see Glaser and Strauss 1967). Grounded theory describes the process of deriving theories from an analysis of the patterns, themes and categories discovered in observational data (Babbie 2001). According to Creswell (1997) grounded theory involves the coding of categories in events and behaviour to discover substantive-level theory. These codes eventually saturate, allowing comparisons. Grounded theory relies on inductive principles where data are often collected in the absence of hypotheses (Glaser and Strauss 1967). The analytical techniques used for this approach were constant comparison, content analysis and pattern matching.

### 2.2.1 Constant Comparison

The constant comparison method involves "... *explicit coding and analytic procedures*" (Glaser and Strauss 1967) that will generate theories in a systematic manner. It is a method of comparative analysis, and is generally used jointly with theoretical sampling of qualitative data (Creswell 1997). The constant comparison method was used to develop categories for the qualitative data documented in the purposive sample of hard law standards. Miles and Huberman (1984) wrote that categorizing is essentially a data reduction

technique. It involved a systematic process of identification to create groups or clusters in the data (Dey 1993). This facilitated data organization for the analysis. Content analysis, (Section 2.2.2) could then be incorporated. The constant comparative method also involved inductive analytical techniques such as searching for patterns, themes, and categories in the data without imposing expectations before the analysis began (Section 2.2.3) (see Miles and Huberman 1984).

### 2.2.2 Content Analysis

Content analysis is a social science research method used for studying human communications using social artefacts (Babbie 2001). The goal of content analysis is to quantify large amounts of qualitative data for the purpose of data reduction and generalization (Northey et al. 2002). It involves the coding of raw data into a standardized form according to some conceptual framework. It is, therefore, important to specify the definition of each code clearly as they are subject to many interpretations (Babbie 2001). For this research, a restricted approach to content analysis was employed (see Bose 1995), to code the qualitative data extracted from the hard law documents into a standardized form using the categories developed through the constant comparison method.

### 2.2.3 Pattern Matching (Matrix Analysis)

The qualitative data analysis technique of pattern matching (or matrix / logical analysis) was also used. Yin (1994), Miles and Huberman (1994), Babbie (2001) and Northey et al. (2002) recommended this technique as an effective method of data display in qualitative data analysis. Pattern matching provides an outline of generalized causation, logical reasoning processes, etc., by using data displays (i.e., matrices, flow charts, diagrams, graphs) and written descriptions to allow the drawing of justified conclusions (Miles and Huberman 1984). It was used in the present study to explore patterns and determine interrelationships in the detailed information obtained through the analysis of hard law documentation (Frechtling et al. 1997). It was also used to present

the information in an immediately accessible and compact form.

## 2.3 Quantitative Analysis

Based on the results generated through the qualitative analysis, cell values of 1 (presence) or 0 (absence) were assigned to each of the monitoring and information reporting requirements (see also Hickey et al. 2006). Quantitative analyses were then conducted using the chi square test for homogeneity of proportions and the hierarchical cluster analysis method.

### 2.3.1 Chi Square Test for Homogeneity of Proportions

According to Bluman (2001) this test is useful when the researcher is interested in determining whether the distribution of proportions among  $n$  populations have a common characteristic or are different. It is considered conservative and determines whether the proportions for each element are equal across all populations [i.e., the null hypothesis ( $H_0$ ) is that there is no difference in the distribution of proportions among the  $n$  populations ( $p_{1i} = p_{2i} = p_{ni}$ )]. The following formula was used to compute the expected values ( $E$ ) (Bluman 2001):

$$E = \frac{(\text{row sum})(\text{column sum})}{\text{grand total}} \quad (1)$$

To find the test value, the following formula was used:

$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad (2)$$

In this case,  $O$  represents the observed value. The critical value was then obtained from the  $\chi^2$  distribution table, at  $\alpha=0.05$ , with degrees of freedom = (rows - 1)(columns - 1). A practical limitation of the test was that for each category being compared, the expected value had to be greater than five. Where the expected values were less than five, categories were combined [as recommended by Bluman (2001)].

### 2.3.2 Hierarchical Clustering

Cluster analysis is widely used in many fields of social science (Gelbard and Spiegler 2000) and can be used to define ‘objective’ groups based on similarities and differences in data (Brewerton and Millward 2001). The aim of cluster analysis is to minimize the distance between individual objects while maximizing the distance between groups (Everitt 1974). In the present study, the ‘average’ and ‘complete’ methods of clustering were used to graphically display the relative distances between each case study matrix. This analysis was done using SAS Version 8.3. To determine the distance between the qualitative data presented in the matrix, the ‘Manhattan’ distance technique (also known as the city-block metric) was used. The formula for this distance ( $d$ ), between a point  $X=(X1, X2, \text{etc.})$  and a point  $Y=(Y1, Y2, \text{etc.})$ , is:

$$d = \sum_{i=1}^n |x_i - y_i| \quad (3)$$

The resulting (absolute) values were then summed for each case study to provide a relative distance matrix. The Manhattan distance was the appropriate technique for handling the qualitative presence/absence (categorical) data because it doesn’t square the coordinates (unlike the Euclidean distance technique).

### 2.4 Assumptions and Limitations

This study was based upon the assumption that the monitoring and information reporting requirements documented in forestry-related hard laws can provide important context for comparing forestry practices and perceptions in different jurisdictions. There are a number of limitations associated with a study of this kind. These limitations are generally related to the inductive and investigative processes associated with exploratory research methods. When analyzing legislation, issues related to the enforceable reach of a law; who has responsibility for its enforcement; variable levels of responsibility; and the influence of local units of government on legislation complicate the process of inter-jurisdictional com-

parison (Ellefson and Hibbard 2003, Bauer et al. 2004). These complexities present problems that are relevant in each of the selected jurisdictions and are a limitation to the analysis presented in this paper.

Another issue that relates to hard law regulation is that major differences in policy often result from subtle differences in wording (Cashore and McDermott 2004). While this is obviously an important point of consideration, our research did not explicitly consider the degree of discretion involved in enforcing the law. Instead, our analysis relied on the presence of elements within the hard law standards (see also: Hickey et al. 2006).

## 3 Results

Using the constant comparison and content analysis methods, 11 descriptive categories emerged from the analysis of hard law standards, with a number of monitoring and information reporting requirements subsequently associated with each category (Table 3). These results indicate that the majority of the monitoring and information reporting requirements in the selected hard law documentation related to ‘Licenses, records and reporting’ (114), ‘Administration and regulation’ (102) and ‘Harvesting operations and inspection’ (94) issues. Within each jurisdiction, the

**Table 3.** Categories and total monitoring and information reporting requirements from the selected hard law documentation.

Categories	Requirements
1 Administration and regulation	102
2 Policy and objectives	31
3 Management and planning	70
4 Forest resource protection	54
5 Forest use and restrictions	79
6 Monitoring and information	44
7 Research and development	35
8 Licenses, records and reporting	114
9 Harvesting operations and inspection	94
10 Damages and remedies	19
11 Penalties and enforcement	33



relevance of the categories and the associated monitoring and information reporting requirements varied.

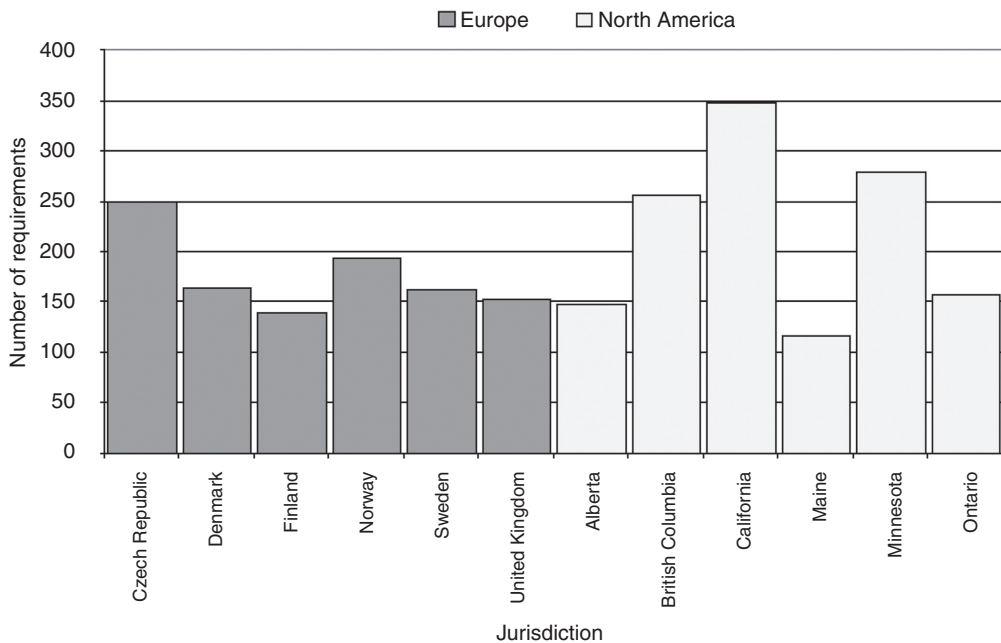
### 3.1 Comparative Analysis by Jurisdiction

Fig. 1 shows the total number of monitoring and information reporting requirements documented in the hard law legislation that was analyzed. Based on the selected legislation, the analysis indicated that the Californian Forest Practices Act (348 requirements) contained the most references to monitoring and information reporting, followed by the combined requirements of Minnesota’s Sustainable Forest Resources Act 89A and the Minnesota State Forests; Tree Planting; Forest Roads Act 89 (280 requirements). British Columbia’s Forest and Range Practices Act (256 requirements), and the Czech Republic Forest Act (250 requirements), also had a high number of requirements.

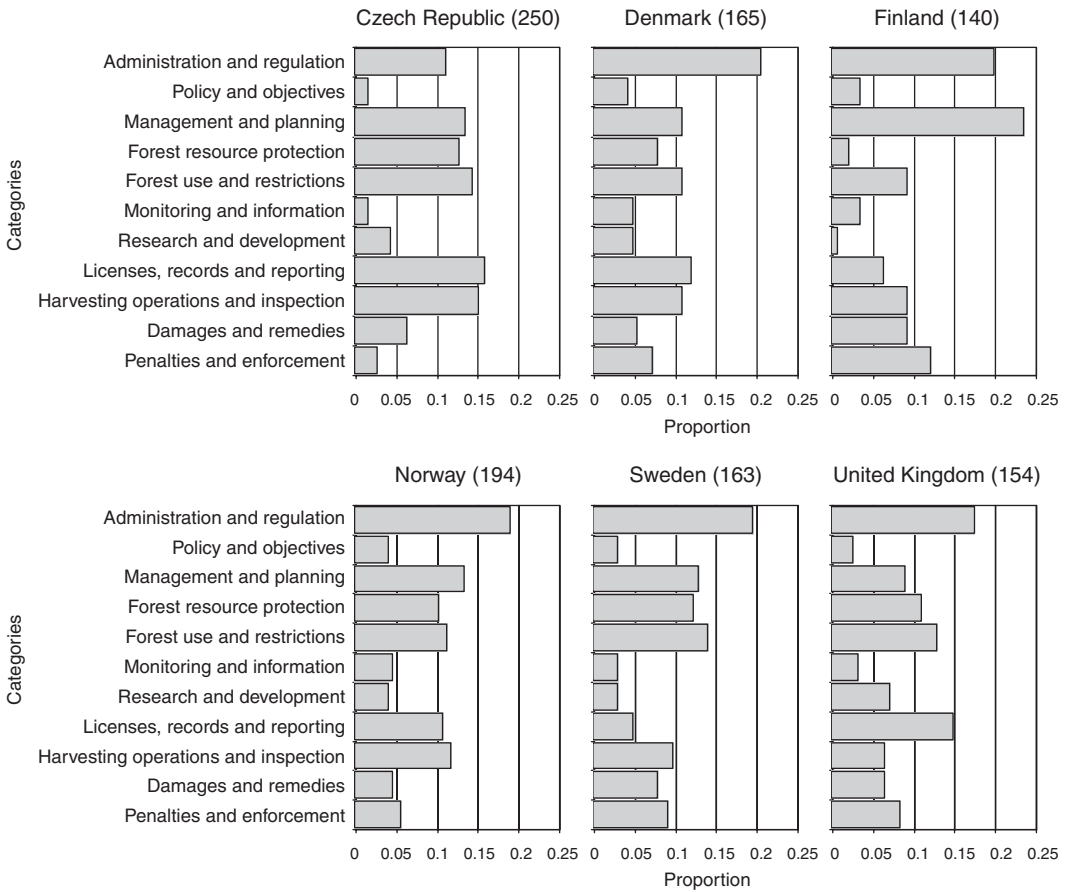
The nature of the monitoring and information

reporting required by the selected hard law documents are presented in Fig. 2 (European jurisdictions) and Fig. 3 (North American jurisdictions). When interpreting these data, it was important to note that the findings are based on a purposive sample of hard law documents related to forestry in the relevant jurisdictions. Due to the large number of inter-related environmental laws available in each jurisdiction (Annex 1) it is likely that the actual SFM-related monitoring and information reporting required by hard laws will differ dramatically from the figures presented. Therefore, the purpose of this exploratory analysis was to consider the nature and level of information required by the selected documents rather than determine ‘better’ or ‘worse’ legislation.

Overall there were both similarities and differences in the monitoring and information reporting requirements documented in the selected hard law standards from European jurisdictions (Fig. 2). All of the jurisdictions required a degree of monitoring and information reporting for each of the 11 SFM-related categories. Despite a large dif-



**Fig. 1.** Hard law monitoring and information reporting requirements in selected jurisdictions (totals). The average number of requirements documented in the European sample was 178, while the average for the North American sample was 218.



**Fig. 2.** Monitoring and information reporting requirements documented in selected hard law standards: distribution of proportions. The (number) following each title indicates the total number of monitoring and information reporting requirements.

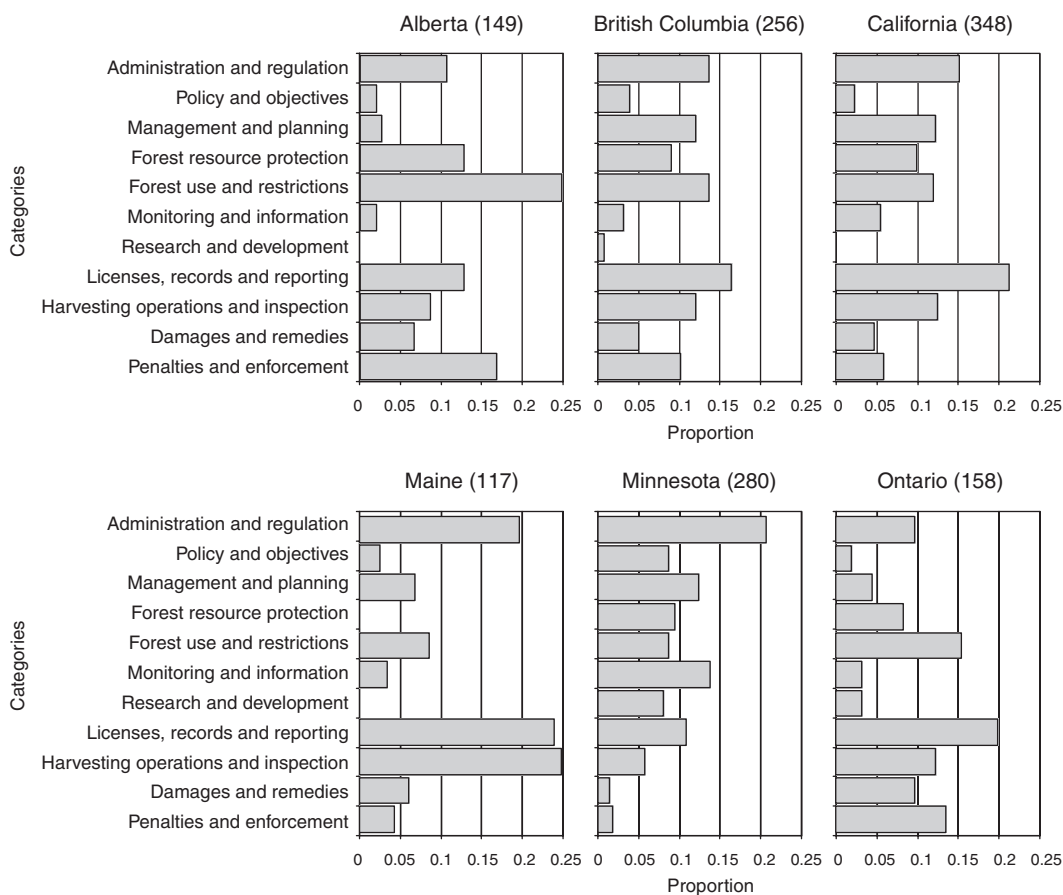
ference in the number of specific requirements (Fig. 1) the general categories addressed by the hard law documentation revealed consistency (particularly Denmark, Norway, Sweden and the United Kingdom). The chi square test for homogeneity of proportions indicated that at least one of the proportions within the European sample of hard law was significantly different ( $\alpha=0.5$ ) from the others [see Table 4(a)].

Fig. 3 shows the relative distribution of monitoring and information reporting requirements obtained from the selected hard law standards from North America. As with the European analysis, despite a quite dramatic difference in the number of specific requirements (Fig. 1), the general cate-

gories addressed by the hard laws revealed a level of consistency (particularly in British Columbia, California and Ontario). However, not all of the documents contained monitoring and information reporting requirements related to ‘Research and development’ (Alberta, California and Maine) or ‘Forest resource protection’ (Maine). The chi square test for homogeneity of proportions indicated that at least one distribution of proportions was significantly different ( $\alpha=0.5$ ) from the others [see Table 4(b)].

The hierarchical cluster analysis resulted in four distinct clusters based on the qualitative data (Fig. 4), two of which were individual jurisdictions (Minnesota and California). The





**Fig. 3.** Monitoring and information reporting requirements documented in selected hard law standards: distribution of proportions. The (number) following each title indicates the total number of monitoring and information reporting requirements.

**Table 4.** Hard laws: Chi square test for the homogeneity of proportions ( $\alpha=0.05$ ).

Comparison*	Test value	Critical value	Decision
a) Europe (within sample)	68.913	37.652	Reject $H_0$
b) North America (within sample)	160.313	37.652	Reject $H_0$
c) Europe v. North America (averages)	2.833	11.071	Do not reject $H_0$
d) All (within entire sample)	243.471	79.082	Reject $H_0$

$H_0: (p_{1i} = p_{2i} = p_{ni})$

$H_1$ : at least one distribution of proportions is different from the others

\* Some of the categories were combined during this analysis to meet the assumptions of the statistical test (see Bluman 2001). Subsequently six categories were compared:

- 1) 'Administration and regulation'
- 2) 'Policy and objectives' AND 'Management and planning'
- 3) 'Forest resource protection' AND 'Forest use and restrictions'
- 4) 'Monitoring and information' AND 'Research and development' AND 'Licences, records and reporting'
- 5) 'Harvesting, operations, and inspections'
- 6) 'Damages and remedies' AND 'Penalties and enforcement'

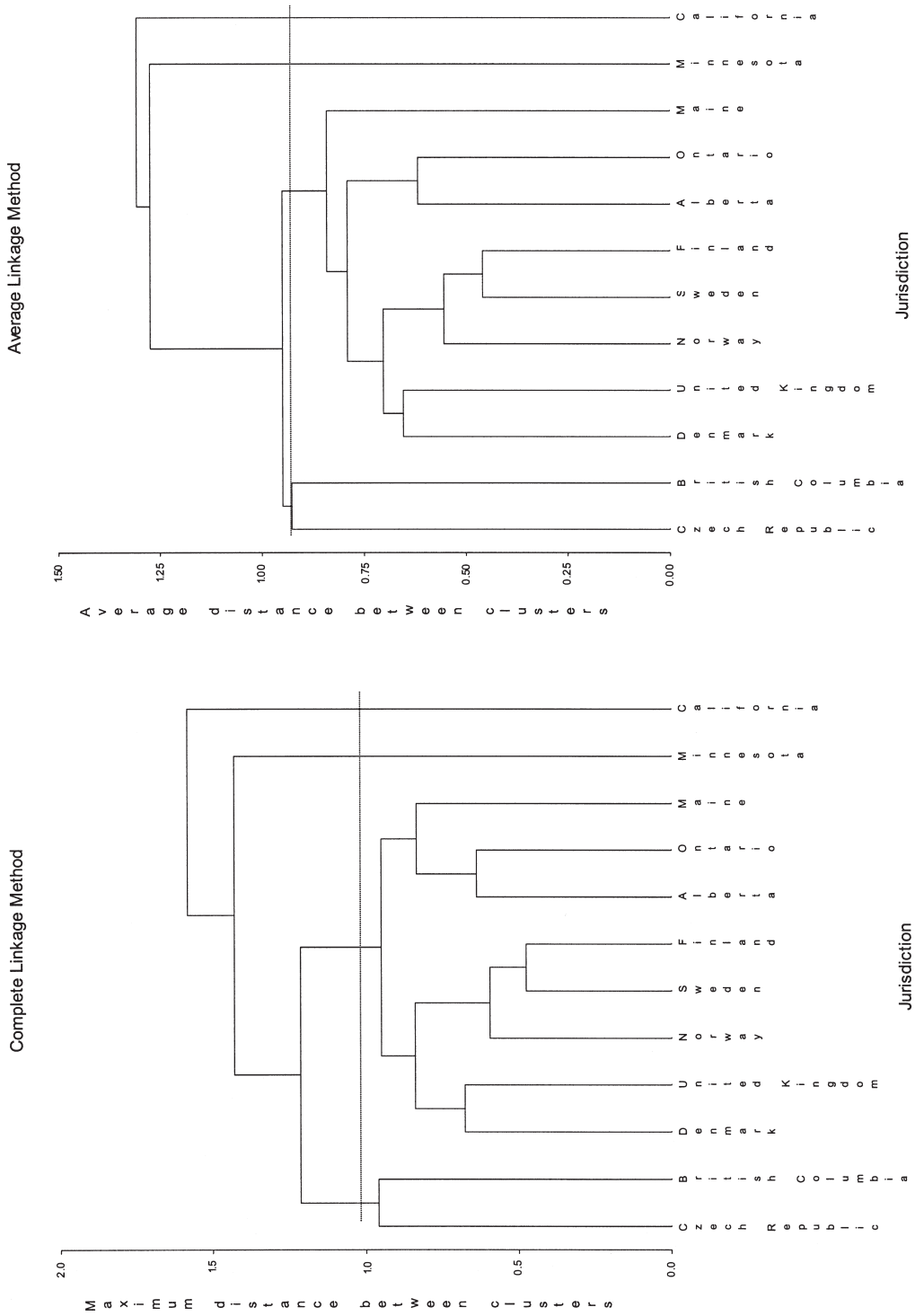


Fig. 4. Hierarchical cluster analysis

Czech Republic and British Columbia comprised another group while the remaining jurisdictions (including all Scandinavian countries) made up the final cluster. When considering the results of cluster analysis, Everitt (1974) recommended using various “intuitively reasonable” methods for validating clusters. The clusters presented in Fig. 4 satisfy the following tests:

*Logic:* the results of the cluster analysis support the expected observations resulting from the qualitative and descriptive analyses; and

*Different clustering techniques:* both the ‘complete’ and ‘average’ techniques resulted in the same clusters.

### 3.2 Comparative Analysis by Region

Fig. 5 shows the North American and European sample averages related to monitoring and information reporting requirements. While the average sample proportions for North America and Europe were very similar, a higher proportion of the European documentation required monitoring and information reporting related to ‘Management and planning’. Based on the hard laws selected for analysis, the requirements documented in the North American standards had a higher proportion of their monitoring and information reporting requirements related to ‘Licenses, records and reporting’. The chi square test for homogeneity of proportions indicated no significant difference ( $\alpha=0.05$ ) between the average distribution of proportions for Europe versus North America [Table 3(c)]. While there was a high level of variability in the specific monitoring and information reporting requirements, there were also areas of consistency across the sample (see Table 5).

## 4 Discussion and Conclusion

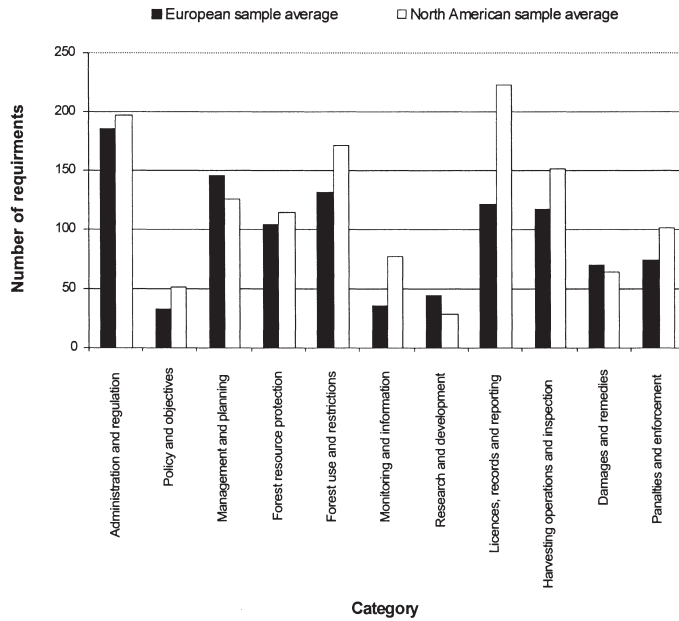
Brunnee and Nollkaemper (1996) wrote that, in the face of mounting pressure on the world’s forests, there have been attempts to clarify the values that underlie international forest policy to promote further development of the law. The analysis presented here considered data associated with forestry-related monitoring and information

reporting to provide a comparative description of certain hard-law requirements in a sample of jurisdictions. This was done to shed light on the potential for coordinated monitoring and information reporting objectives to be mandated through inter-jurisdictional hard law.

Abbott (2000) noted that hard laws have the potential to reduce transaction costs, constrain strategic government behaviours, reduce risk premiums for investors, provide guidance to bureaucrats and promote transparency functions. Despite a high degree of variability in many of the specific requirements documented in the purposive sample of hard laws, our research supported this observation. Specifically, the data indicated the central role of domestic government regulatory bodies, third-party forestry inspection boards and advisory committees in each jurisdiction, and specified the level of monitoring and information reporting required when harvesting forest resources. These observations are supported by Cabbage et al. (1993), who noted that regulatory mechanisms generally place rule-making authority in representative bodies that have access to the information they require. For example, California’s forest regulations are created by the California Board of Forestry and assessed by a range of other state agencies<sup>3</sup> (Dicus and Delfino 2003). This promotes transparency, and is similar in intent to many soft law standards of forest management (see Hickey et al. 2006).

According to McKay and Moeller (2002), the public usually views mandatory regulation as an assurance that stated goals and objectives are being met. Our results confirmed this observation, revealing a strong demand for checking, compliance, correction, enforcement<sup>4</sup>, reporting and reviewing by public agencies in each jurisdiction. While not explicitly stated, the nature of the information required by the selected hard laws was primarily concerned with compliance monitoring, rather than effectiveness (Mulder *et al.* 1999) or validation monitoring (Niemann and Innes 2004). In terms of adaptive management, this can be considered a limitation of hard law regulation, as laws are almost inevitably responsive to the current environment and are rarely capable of anticipating future problems (Shelton 2000). This is an area where soft laws are playing an important role in terms of monitoring and

(a) Number of requirements: Europe sample average versus North America sample average



(b) Distribution of proportions: Europe sample average versus North America sample average

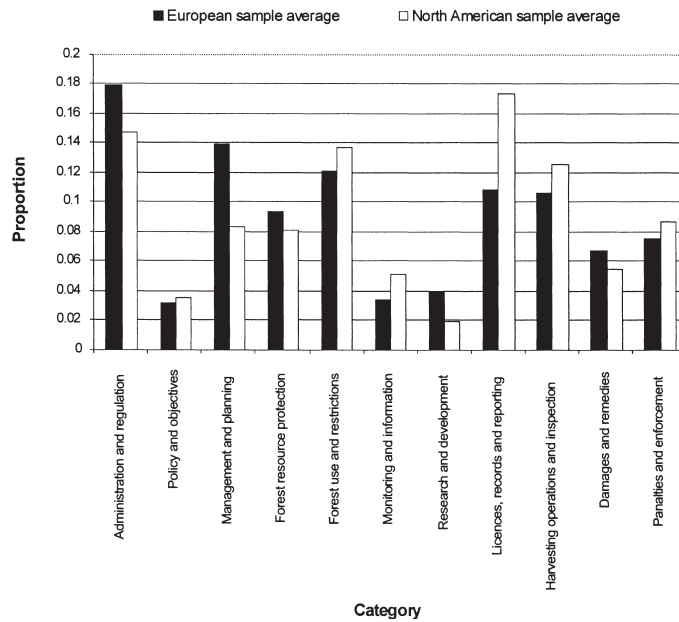
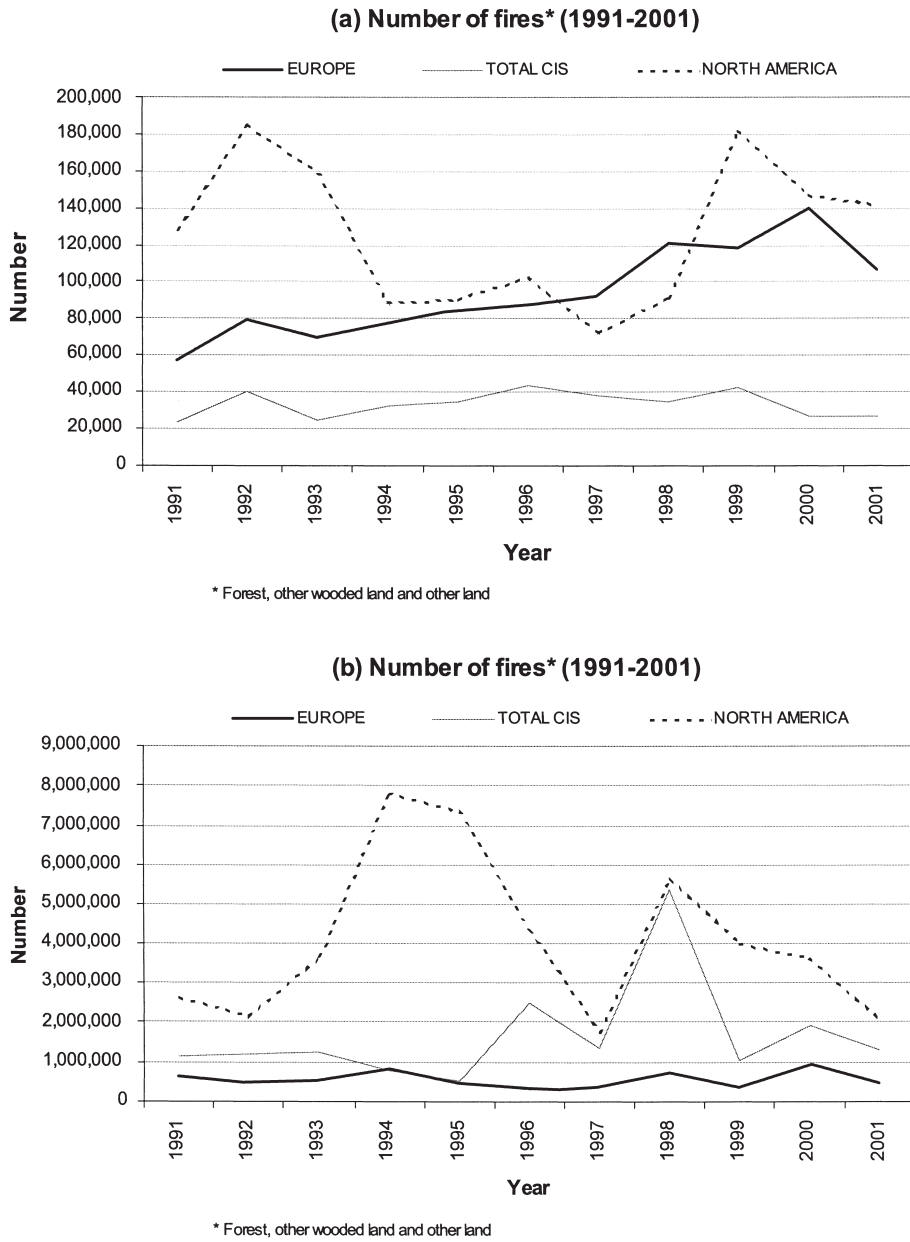


Fig. 5. Hard laws: Europe sample average versus North America sample average.

**Table 5.** Monitoring and information reporting requirements that were generally consistent across the sample of hard law documentation.

## Categories

- 
- 1 Administration and regulation  
 Purpose; administration (delegation of powers, areas of application)  
 Forest management board/panel (to advise the Minister/Commissioner)  
 Regulations (terms and conditions; charges/fees; means of enforcement; logging methods and wood utilization standards; transfer or sale of property; natural disasters; prevention activities; forest management guidelines)
- 2 Policy and objectives  
 Sustainability (balance between timber growth and depletion; minimizing adverse effects on plant life, animal life, water, soil, air, social and economic values, including recreational values and heritage values)
- 3 Management and planning  
 Forest classification/boundaries (protection forests; special purpose/habitat forest; commercial forests/timberland production areas)  
 Regional plans / objectives  
 Management units (harvesting plans; objectives and strategies; evaluation of plant life, animal life, water, soil, air, social and economic values including recreational values and heritage values; guidelines)  
 Regeneration standards (timeframe; commercial tree species; minimum stocking; methods)
- 4 Forest resource protection  
 Forest protection considerations (significance to forest functions; roads/road network; protection against abiotic and biotic damages; effects of actions on neighbouring lands)  
 Forest health [damages (occurrence and extent; implementation of necessary measures; precautionary measures; abiotic and biotic)]
- 5 Forest use and restrictions  
 Forest land use; forest users (restrictions)  
 Terms and conditions (security deposit; compliance; payment of fees; harvest areas; reforest or reforestation levy; silvicultural standards to be met)  
 Harvesting limits; exemptions (incidental felling to ensure forest health)
- 6 Monitoring and information  
 Availability of resources for protection; ownership of forest resources; payment of fees  
 Inventories, surveys, tests and studies; information made available to the Minister/Commissioner.
- 8 Licenses, records and reporting  
 Approval of forest management/stewardship/harvesting plans by Minister/Commissioner (details of land affected by decision, intention served, methods and deadlines)  
 Amendment of licences; compensation for amendments; appeals  
 Notification prior to harvesting; transfer of licenses/rights; sale of land subject to license; boundary surveys.
- 9 Harvesting operations and inspection  
 Forest operations prescriptions (current structure and condition of the forest area; harvesting, renewal and maintenance activities; standards for clearcuts, regeneration and conduct of operations)  
 Records (complete and accurate; reforestation records)
- 10 Damages and remedies  
 Damage / violation of Act  
 Repairs (actions specified; liability; public compensation)  
 Work schedules (conformance; consistency with other plans)
- 11 Penalties and enforcement  
 Administrative penalties; suspension/cancellation of license (compliance, failures)  
 Seizure of forest resources and products; entry on private lands; inspection of records/vehicles  
 Offences (fines; imprisonment)
-



**Fig. 6.** Number and area of fires per annum in Europe, the Commonwealth of Independent States (CIS) and North America, 1991–2001. Source: UNECE/FAO (2002).



reporting for SFM (Hickey 2004a). As noted by Cashore and McDermott (2004), research related to the effectiveness of hard law in achieving desired outcomes is crucial if we are to understand how forest regulations impact and address environmental deterioration. While our research does not address this issue, the results do support the need further investigation of effectiveness monitoring through hard law regulation.

Dicus and Delfino (2003) noted that hard law generally relies on specific and prescriptive requirements for individual forestry operations to protect various environmental parameters. With relation to environmental measures and assessments, the sample of hard law documentation analyzed in this study revealed a strong focus on monitoring and information reporting related to forest health, forest protection and regeneration/reforestation. These categories can be seen as covering the fundamental environmental issues related to forestry that are of interest to government. Mortimer et al. (2003), who noted that hard law should be closely tailored to legitimate state interests in forest regulation, supports this finding. In the North American jurisdictions, fire-related monitoring and information reporting was also a common requirement. This finding is not surprising when we consider that the annual land area affected by fire in North America is significantly greater than in Europe (see Fig. 6). This is mainly due to Europe's history of long-term intensive land use, which has resulted in a patchwork of forest, shrub and cultivated land with species composition and fuel loads that are very different to pre-settlement (or 'natural') patterns (Shakespeare and Doerr 2006).

The advantage of traditional 'hard' regulation is that it is universally applicable, thereby enabling a level of standardization in the monitoring data collected (Hickey 2004a). However, the relevance of the data and information generated through hard laws differ between societies (MacCormick and Weinberger 1986, Fingleton 2002). The results of our analysis clearly indicate that similarities exist between the selected jurisdictions. The results from the cluster analysis (Fig. 4) revealed close similarities in the monitoring requirements documented in the predominant forestry legislation from the United Kingdom, Denmark, Sweden, Norway and Finland. This may reflect similarities

in forest ownership patterns (see Table 1). It may also reflect policy consistency resulting from the various directives and regulations of the European Community (EC)<sup>5</sup>. In contrast to our findings, Bauer et al. (2004) noted wide differences in the form and content of national forest legislation in Europe, particularly in relation to the basic legal framework and doctrine, degree of detail and enforcement mechanisms. This suggests that the results of our research (limited to monitoring and reporting) need to be considered in a broader regulatory context before any definitive statements about comparability can be made.

Fig. 5 shows a comparison of the European versus North American requirements (sample average) for the selected hard laws. Despite variability in the number of requirements, there were similarities across the selected legislation. These similarities covered a broad range of issues associated with SFM. While there are acknowledged differences in national (and in the case of Federalised countries, sub-national) legislation, similarities in the monitoring and information reporting requirements of certain hard law regulation is an important finding, and may indicate a potential for improved international hard laws related to monitoring SFM progress. With regard to the potential for international forest laws, Brunnee and Nollkaemper (1996) noted that tension exists between claims of sovereignty over forests and the emerging legal principles that guide international law (i.e., principles of common concern, inter-generational equity and precaution) (see also Tarasofsky 1999, Hickey and Innes 2005). According to Bauer et al. (2004), convergence is already happening, with the expansion of forestry related international law increasingly influencing national policy and law (Tarasofsky 1999). While the results of our hard law analysis are drawn from only a sample of the forest-related regulatory requirements in each jurisdiction, they do provide an interesting perspective on the potential for comparability and inter-jurisdictional synergies in monitoring and information reporting through hard law mechanisms.

Fingleton (2002) noted that forestry laws need to fit into a jurisdiction's system of government, its budgeting arrangements, as well as a range of other legislation covering environmental protection, land tenure, land use and business and

revenue laws (Hickey 2004a). With reference to the USA, Ellefson and Hibbard (2003) noted that forestry-related hard laws were far-ranging, often addressing issues related to environmental conditions, timber harvesting and the protection of 'special' features. These observations were supported by the monitoring and information reporting requirements documented in the purposive sample of hard law used in our study. The extent to which hard law addresses the broad range of SFM issues faced within a particular jurisdiction is important because it is often assumed that the monitoring and information reporting requirements documented in soft law standards exceed the requirements of hard law (Hickey et al. 2006). Therefore, the gap between legal and soft law requirements is an important area for future research (for example, see Dicus and Delfino 2003).

Overall, the results of our research indicate a high degree of similarity in the nature of monitoring and information reporting required by a purposive sample of hard law from different jurisdictions. These findings provide an important perspective that can inform future research and development in the fields of forest policy and management, particularly in relation to resource monitoring and information reporting. In 1996, Brunnee and Nollkaemper noted that "...despite the diversity of forests and forest concerns between regions and continents, there is an important role for a set of general legal principles, objectives and procedures defining the parameters and establishing the ground rules of global forest law". Our research suggests that further comparative analysis of hard law monitoring and information reporting requirements could form a central theme in defining the 'ground rules' of a global forest law.

## Notes

- 1 In forestry, monitoring and information reporting is also essential for adaptive management (see Holling 1978).
- 2 Examples of forestry-related soft law mechanisms include non-binding international treaties [e.g. the Montreal Process (1995)]; third-party certification [e.g. Forest Stewardship Council (FSC) (1993)], and

industry-led initiatives [e.g. the British & Irish Hardwoods Improvement Programme (BIHIP)] (Hickey 2004a).

- 3 In this case, the California Department of Forestry and Fire Protection (CDF) acts as the lead agency with direct involvement from the Department of Fish and Game (DGF), Regional Water Quality Control Board (RWQCB), the Department of Geological Survey, and others (Dicus and Delfino 2003).
- 4 McKay and Moeller (2002) noted that when environmental regulations have insufficient enforcement, they often lack credibility and may lead to political backlash (Spiller 1996).
- 5 The European Community has adopted a range of legislation related to forests (see Annex 1). According to Bauer et al. (2004), these policies and regulations refer to funding for afforestation, protection of forests, harmonisation of procedures for data collection and other related activities.

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*Total of 47 references*

## Annex 1

<b>USA (FEDERAL)</b>
Focus Directly and Exclusively on Forests and Forestry
Cooperative Forestry Assistance Act of 1978
Forest Conservation and Shortage Relief Act of 1990 (timber exports)
Forest and Rangeland Renewable Resources Planning Act of 1974
Multiple-Use Sustained Yield Act of 1960
National Forest Management Act of 1978
National Forest System Drug Control Act of 1986
Renewable Resource Extension Act of 1978
Focus Broad Based, Including (but not exclusive to) Forests and Forestry
Administrative Procedures Act of 1946
Archaeological Resources Protection Act of 1979
Clean Air Act of 1990
Clean Water Act of 1987
Coastal Zone Management Act of 1972
Endangered Species Act of 1973
Federal Insecticide, Fungicide and Rodenticide Act (as amended 1996)
Federal Land Policy and Management Act of 1976
Federal Noxious Weed Act of 1974
Fish and Wildlife Conservation Act of 1980
National Environmental Policy Act of 1969
National Trails System Act of 1968
National Wildlife Refuge System Administration Act of 1966 (1997)
Occupational Safety and Health Act of 1970
Public Lands U. S. Criminal Code of 1948
Soil and Water Conservation Act of 1977
Solid Waste Disposal Act of 1986
Surface Mining Control and Reclamation Act of 1977
Wilderness Act of 1964
Wild and Scenic Rivers Act of 1968
<b>CANADA (FEDERAL)</b>
Forestry Act of 2000
Timber Marking Act of 2000
Canada Water Act (1984)
Plant Protection Act, 1990.
Seeds Act (2000)
Canada Wildlife Act (2000)
Migratory Birds Convention Act (1994)
National Parks Act 2000
Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act.
Fisheries Act (Chapter F-14) 1985
Resources and Technical Surveys Act 2000.
Canadian Environmental Protection Act 1992
Canadian Environmental Assessment Act.
<b>EUROPEAN UNION</b>
Commission Regulation (EC) No 2278/1999 of 21 October 1999 laying down certain detailed rules for the application of Council Regulation (EEC) No 3528/86 on the protection of the Community's forests against atmospheric pollution
Commission Regulation (EC) No 1727/1999 of 28 July 1999 laying down certain detailed rules for the application of Council Regulation (EEC) No 2158/92 on protection of the Community's forests against fire
Commission Regulation (EC) No 1091/94 of 29 April 1994 laying down certain detailed rules for the implementation of Council Regulation (EEC) No 3528/86 on the protection of the Community's forests against atmospheric pollution
Commission Regulation (EC) No 804/94 of 11 April 1994 laying down certain detailed rules for the application of Council Regulation (EEC) No 2158/92 as regards forest-fire information
89/367/EEC: Council Decision of 29 May 1989 setting up a Standing Forestry Committee
Regulation (EC) No. 2152/2003 of the European Parliament and of the Council concerning monitoring of forests and environmental interactions in the Community (Forest Focus).
Commission Regulation (EC) No. 1602/2002 laying down detailed rules for the application of Council Directive 1999/105/EC as regards the authorization of a Member State to prohibit the marketing of specified forest reproductive material to the end-user.
Commission Regulation (EC) No. 1597/2002 laying down detailed rules for the application of Council Directive 1999/105/EC as regards the format of national lists of the basic material of forest reproductive material.
Commission Regulation (EC) No. 445/2002 laying down detailed rules for the application of Council Regulation (EC) No. 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF).
Regulation (EC) No. 2494/2000 of the European Parliament and of the Council on measures to promote the conservation and sustainable management of tropical forests and other forests in developing countries.
Council Directive 1999/105/EC on the marketing of forest reproductive material.
Council Decision 66/399/EC setting up a Standing Committee on Seeds and Propagating Material for Agriculture, Horticulture and Forestry.

<b>CZECH REPUBLIC</b>
Forest Act (1995)
Water Act (2001)
Act on the Environment (Law No. 17/1992).
Act No. 244 of the Czech National Council as of 15 April 1992 on Environmental Impact Assessment.
Regulation of the relations of ownership of land and other agrarian property (Act of 21 May 1991).

<b>DENMARK</b>
Act on the Environment and Genetic Engineering (No. 356 of 1991).
Act relative to financial support for the development of rural districts (No. 338 of 2000).
Environment Protection Act (1997)
Protection of Nature Act (No. 9 of 1992).
Soil pollution Act (1999)
Forest Act (1989)
Act relative to flood prevention (2000)
Act relative to watercourses (1992)

<b>FINLAND</b>
The Forest Act (1996)
Nature Conservation Act (1996)
Private Forest Act (1967)
Act on the financing of Sustainable Forestry (1996)
Act on Wilderness Reserves
Conditional Fine Imposition Act
Act on Forestry Centres and the Forestry Development Institute (1995)
Forest and Park Service Act (1994)
Act on Structural Policy Measures in Agriculture and Forestry
Fisheries Act (1982)
Forest Conservation and Management Association Act (1998)
Act relative to the participation of co-owners in measures in accordance with legislation relative to the financing of forestry (1996)
Forest Insect and Fungi Damage Prevention Act (1991)
Forestry Centre and District Forestry Board Act (1991)
Rural Activities Management Act (1990)
Act relative to Common Forests (1991)
Kolтта Sami Act (1984)
Protection Forest Act (1922)
Act No. 377 of 1995 relative to genetic engineering.
Act No. 113 of 2000 relative to the introduction of new environment legislation.
Act No. 737 relative to compensation of ecological damage (1994)
Water Act (1961)
Reindeer Breeding Act (1990)
Forest Management Association Act (1950)
Act relative to voluntary participation of industrial enterprises in environment protection and environmental auditing proceedings (No. 1412 of 1994).
Environment Protection Act (No. 86 of 2000).
Act No. 81 of 1998 to provide for ecological damage insurance.
Act relative to environment permit authorities (No. 87 of 2000).
Act relative to the administration of the Environment (No. 55 of 1995).
Forest improvement Act (1987)
Nature-based Activities Act (1984)
Act relative to procedures of environment impact assessments (No. 468 of 1994).



<b>NORWAY</b>
Act on forests for Domestic Use (1939)
Duty on Timber for the Financing of Common Measures in Forestry Act (1956)
Act on Management and Conservation of Forests on State Owned Common Land (1992)
Act relating to Forestry and the Protection of Forests (1965)
Act No. 16 of 1917 to provide for the acquisition of waterfalls, mines and other real property
Act No. 77 of 1985 relative to planning and construction.
Act No. 17 of 1917 to provide for the regulation of watercourses.
Act No. 3 of 1940 relative to watercourses.
Act No. 82 of 1977 relative to the use of motor vehicles on uncultivated land and watercourses.
Act No. 82 of 2000 relative to watercourses and groundwater.
Act No. 104 of 1988: Product Liability Act.
Act No. 21 of 1976 relative to implementation in Norwegian law of the Nordic Environment Protection Convention between Denmark, Finland, Norway and Sweden of 19 February 1974.
Act No. 23 of 1995 concerning land use.
Act No. 31 of 2003: Act relative to the right to information regarding the environment and the right to participate in decision-making processes affecting the environment (Environment Information Act).
Act No. 32 of 1996 relative to the State Nature Supervision Agency.
Act No. 63 of 1970: Nature Conservation Act.
Act No. 90 of 1981 relative to the labelling of consumer goods.
Act No. 77 of 1985 relative to planning and construction.
Act No. 79 of 2001 relative to environment protection on Svalbard.

<b>SWEDEN</b>
Act No. 639 concerning the preliminary inspection of biological pesticides (1991)
Act concerning European Community regulations relative to environment and structural aid (1994)
Act relative to genetically modified organisms (1994)
Act relative to the Environment Protection Convention between Finland, Norway, Denmark and Sweden of 19 Februari 1974.
Act relative to the implementation of a Community Eco-label Award Scheme (1995)
Act relative to voluntary environment management and audit (SFS 1994:1596).
The Forestry Act
The Nature Conservation Agreement
Cultural Heritage Act
Act relative to the obligation to provide information in the agricultural sector (1992)
Land Acquisition Act
Act concerning European Community regulations relative to Environment and Structural Aid (1994)
Act relative to the Obligation to Provide Information in the Agricultural Sector (1992)
Act relative to Spreading of Pesticides over Forestry Land (1984)
Forest Protection Act (1979)
Act relative to the management of natural resources (1987)
Act relative to management of societies (1973)
Act on the implementation of the Water Act of 1983 (1984)
Water Law of 1983.

<b>UNITED KINGDOM</b>
Scotland Act (1998)
Water Environment and Water Services (Scotland) Act 2003 (Asp 3 of 2003).
Water (Prevention of Pollution) (Code of Practice) (Scotland) Amendment Order 2001 (S.I. No. 175 of 2001).
Water and Sewerage (Conservation, Access and Recreation) (Code of Practice) Order 2000 (S.I. No. 477 of 2000).
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Flood Prevention and Land Drainage (Scotland) Act 1997.
Environmental Protection Act 1995 (Chapter 25).
Land Drainage Act 1991 (Chapter 59).
Water Resources Act 1991 (Chapter 57).
Water Act 1989 (Chapter 15).
Salmon and Freshwater Fisheries Act 1975 (Chapter 51).
Water Act, 1973.
Water Resources Act 1963 (Chapter 38).
Pollution Prevention and Control Act 1999 (Chapter 24).
Environmental Protection Act 1990 (Chapter 43).

<b>ALBERTA</b>
Forests Act (2000)
Forest Reserves Act (2000)
Forest and Prairie Protection Act (2000)
Land and Forest Utilization Act (1955)
Forest Profession Act
Environmental Protection and Enhancement Act (E-12 RSA 2000).
Water Act (W-3 RSA 2000).
Natural Resources Conservation Board Act (N-3 RSA 2000).
Public Lands Act (P-40 RSA 2000).
Soil Conservation Act (S-15 RSA 2000).
Wilderness Areas, Ecological Reserves and Natural Areas Act
Wildlife Act
Public Lands Act 2000

<b>BRITISH COLUMBIA</b>
Park Act (Chapter 344) (1965)
Ecological Reserve Act (Chapter 103) (1971)
The Fisheries Act
Commissioner on Resources and Environment Act (Chapter 59).
Forest Act (1978)
Foresters Act (1996)
Sustainable Environment Fund Act (Chapter 445) (1990)
Ministry of Environment Act (Chapter 299) (1980)
Skagit Environmental Enhancement Act (Chapter 426) (1996)
Forest Stand Management Fund Act (1996)
Ministry of Forests Act (1978)
Forest Renewal Act (1994)
Pesticide Control Act
Riverbank Protection Act (Chapter 408) (1951)
Environment Management Act (Chapter 118) (1981)
Environment and Land Use Act (Chapter 117) (1971)
Range Act
Environmental Assessment Act (Chapter 119) (1994)
Soil Conservation Act (Chapter 434). (1977)
Forest Land Reserve Act (1994)
Water Act (Chapter 483) (1939)
Water Protection Act (Chapter 484) (1995)
Forest and Range Practices Act
Wildlife Act (1982)

<b>ONTARIO</b>
Crown Forest Sustainability Act (1994)
Conservation Authorities Act 1990
Environmental Assessment Act (1990)
Forestry Act (1996)
Forest Tree Pest Control Act (1972)
Lakes and Rivers Act
Logging Tax Act (1963)
Crown Timber Act (1972)
Forest Tree Pest Control Act (1972)
Woodmen's Employment Act (1972)
Woodlands Improvement Act (1966)
Trees Act (1960)
Algonquin Forestry Authority Act (1974)
Public Lands Act (1980)
Forest Fires Prevention Act (1968)
Provincial Parks Act
Ontario Heritage Act
Planning Act
Conservation Authorities Act (1990)
Game and Fish Act

<b>CALIFORNIA</b>
Registered Professional Foresters
California Forest Practice Rules
Sustained Yield Plans for Commercial Forestland
Non-industrial Timberlands
Fish and Game Code
Public Resources Code
Water Code
Statutes: Environmental Health
Forest Practice Act (1973)

<b>MAINE</b>
Tree Growth Tax
Forest Regeneration & Clearcutting Standards 1999
Share Land Zoning
Natural Resource Protection Act
Forester Licensing
Protection of Worker Act
Forest Practices Act 2003
Land Use Regulation Commission Laws and Standards

<b>MINNESOTA</b>
Sustainable Forest Resources Act,
Chapters 10A thru 12 Ethics, Fund Investments, Emergency Management
Chapters 14 thru 16 State Agencies
Chapters 17 thru 43 Agriculture
Chapters 83a thru 84 Natural Resources
Chapters 84a thru 84d Conservation
Chapters 85 thru 87 Recreation
Chapters 88 thru 91 Forestry
Chapters 92 thru 94 Lands and Minerals
Chapters 97 thru 102 Game and Fish
Chapters 103a thru 114b Water
Chapters 114c thru 116l Environmental Protection
Chapters 117 thru 119 Eminent Domain
Chapters 272 thru 289 Property Taxes