



Assessing the potential for forest management practitioner participation in climate change adaptation [☆]



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ABSTRACT

The sensitivity of forests to local climate and the long time periods involved in forest management combine to result in conditions where forests and forest management are vulnerable to climate change. Minimizing the risks and impacts of climate change on forest management outcomes and reducing the vulnerability of forest management systems requires adaptation. Forest management system adaptation is a multi-scale incremental process that involves diverse actors collaborating to define issues, develop options, and implement solutions. Enabling adaptation may require revising assumptions (e.g., assumptions about stationary climate), upgrading formal and informal institutions (including mandates), re-engineering governance, addressing knowledge gaps and information management issues, and changing practices. Given the heightened uncertainty associated with climate change, adaptation also includes enhancing capacities, reducing risks through diversification, increasing flexibility, and enhancing resiliency by creating decision environments conducive to learning, foresight, knowledge integration, and adaptive management. Forest management practitioners have a fundamental role in identifying, evaluating, and implementing climate change adaptation measures. This study develops and applies a framework (derived from recent scholarship on adaptation) for assessing the perceptions of forest management practitioners about issues, challenges, and factors that they consider important relative to their potential to contribute to climate change adaptation. The framework draws from, and ties together various aspects of adaptation process including psychological factors, knowledge management, forest management capacity, institutions and governance, and the state of information methods that support forest management (i.e., planning, monitoring, and assessment). The framework is applied utilizing the results of surveys of forest practitioners in British Columbia, Canada. The application provides an opportunity to test concepts and to identify key barriers from a practitioner perspective. Proof of concept is tested by evaluating the extent to which respondents were able and willing to provide answers to survey questions. In general, responses were robust suggesting some understanding and recognition of the importance and validity of the underlying adaptation concepts by forest professionals. The results suggest that forest professionals have diverse viewpoints about climate change. The majority is concerned and support adaptation. However, a significant minority do not support modification of current forest management. Discourse, education, and engagement are called for. Other key factors that from the perspective of professionals may reduce participation potential include knowledge deficits, lack of mandate to adapt, limited resources for adaptation, institutional barriers, inadequate assessment, and persistence of planning and monitoring approaches that do not account for climate change.

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1. Introduction

Awareness and knowledge of the impacts of climate change on forest management, and of the need for developing and implement-

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ing adaptation strategies is growing (Cleaves, 2014; Keenan, 2015). However, while progress has been made developing and synthesizing general climate change impacts and adaptation knowledge (see for example Ogden and Innes, 2007a; Peterson et al., 2014; Seppala et al., 2009; Locatelli et al., 2008; Millar et al., 2007; Williamson et al., 2009; Lempriere et al., 2008; Johnston et al., 2010; Lindner et al., 2014), the incorporation of climate change considerations into forest management institutions and the implementation of

on the ground actions to mitigate impacts on forest management has not occurred to the degree required to ensure that forest goods and services are sustained for future generations (Seppala et al., 2009; Keenan, 2015; Hansen et al., 2012; Archie et al., 2012; Laatsch and Ma, 2015). A variety of market, social, institutional, governance, and cognitive issues and barriers contribute to adaptive capacity and adaptation deficits (Bierbaum et al., 2013; Biesbroek et al., 2013; Williamson et al., 2012a; Moser and Ekstrom, 2010). An important area relative to understanding adaptation process in the context of forest management systems is research on the role of forest management practitioners in contributing to adaptation process (Amaru and Chhetri, 2013; Yousefpour and Hanewinkel, 2015). This includes analysis to identify the extent to which rational forest management adaptation may be suppressed by underinvestment in practitioner capacity and analysis to identify potential barriers and constraints that limit or restrict forest manager contribution to the adaptation process.

Adaptation in resource management systems has been described as a multi-scale social process that involves diverse agents collaborating, negotiating, sharing information, learning, and collectively developing solutions to problems within particular socio-economic, institutional, and governance system contexts (Adger et al., 2007; Amaru and Chhetri, 2013). Agents include policy actors, science actors, corporate actors, resource managers, and stakeholders. Choices and behavior of individual actors are affected by their own values and beliefs, by the social groups they are part of, by their awareness and perceptions, and by incentives and sanctions associated with formal and informal institutions. All actors have knowledge and information that is relevant to, and necessary for adaptation. In many cases, however, agents face barriers that may limit their ability to contribute effectively to the process of adaptation (Moser and Ekstrom, 2010). This can also limit the adaptive capacity of the system itself. Forest management professionals, as a group, are fundamental to the process of adaptation (Ogden and Innes, 2009; Littell et al., 2012). They represent a significant proportion of the human capital component of forest management systems. They are on the front lines of implementing forest management, and they are the primary source of knowledge and information on viable options for local adaptation (Ogden and Innes, 2007a; Williamson et al., 2005). Moreover, they inform and contribute to adaptation policy at higher strategic levels through networks and professional organizations.

The purpose of this study is to develop and apply a framework for assessing the perceptions of forest managers relative to their ability to contribute to climate change adaptation. The assessment framework is based on a review of relevant adaptation concepts and adaptation process as it pertains to potential practitioner contributions to adaptation objectives. In particular, we examine aspects of three ways in which the adaptation process has been discussed in the literature: (1) as a systematic and ongoing planned process involving assessing vulnerability, identifying and implementing adaptation options, monitoring, and revising management actions; (2) as a process that occurs within a self-regulating management system with features and assets that affect the capacity of the system to rationally respond to climate change and with actors who are responding to incentives and who vary in terms of awareness, perceptions, values and beliefs, and (3) as a process strongly influenced by institutional context and the role of institutions and governance modes in influencing, enabling, or constraining adaptation decision-making and actions by actors within the system. Application of the framework for assessing potential practitioner contribution is then demonstrated using the results of two surveys of forest professionals on climate change in a particular forest management context. The survey responses provide an opportunity to test general adaptation concepts and to better understand factors and issues that influence the ability

of forest management practitioners to contribute to climate change adaptation from a forest practitioner's perspective.

The adaptation context is forest management in the Canadian province of British Columbia (BC). Individuals involved in practicing forest management in BC are required by law (The Foresters Act) to be licensed by the Association of BC Forest Professionals (ABCFP). The ABCFP conducted two surveys of its members on climate change in close association with the University of British Columbia. The adaptation context for this study is similar to forest management on publicly managed forestlands in many places and therefore the assessment framework and survey results are to a degree applicable in other forest management contexts.

This study is relevant to both policy and to the emerging scholarship on forest management adaptation. Successful adaptation to climate change within forest management systems requires the involvement of forest practitioners (Littell et al., 2012; Laatsch and Ma, 2015). Forest practitioners play a fundamental role in the development and implementation of adaptation strategies, policies, and actions. The core thesis of this paper, therefore, is that identifying and assessing the capacity of practitioners to adapt, and barriers and constraints that impede or prevent adaptation action is needed in order to enable and advance adaptation goals in forest management. Understanding practitioner perceptions of adaptation issues and constraints can contribute to effective development and implementation of adaptation policies and strategies. From a research perspective, this study advances understanding of adaptation process for a particular group within a particular social-ecological system. Adger et al. (2007) note there are significant limits in current understanding of adaptation process. Moser and Ekstrom (2010) note that more detailed analysis of specific systems can assist in identifying the kinds of barriers associated with different actors and their role in the adaptation process. Biesbroek et al. (2013) note that the most commonly reported barriers to adaptation relate to institutional and social aspects of systems and that actors and their perceptions of barriers are central to understanding adaptation process. In a forest management science context there is growing acknowledgement of the need for better understanding of the human, institutional, and social aspects of adaptation process in forest management (Keenan, 2015).

This paper is organized as follows. The following section describes the adaptation context and provides an overview of the state of adaptation in British Columbia forest management. Section 3 reviews adaptation concepts that are considered to play a role in the capacity of, and potential for agents to contribute to adaptation. Aspects of adaptation process that are potentially relevant, particularly from the point of view of practicing foresters, are identified and discussed. From the review of concepts an assessment framework for assessing the adaptation potential of forest management professionals is developed. Section 4 describes two surveys of forest practitioners on climate change conducted by the Association of BC Forest Professionals (ABCFP). Section 5 provides an assessment of the perceptions of forest practitioner relative to factors and issues that affect their potential to adapt to climate change based on application of the framework using the survey results. Section 6 provides a general assessment of the broader implications of the survey results for adaptation in forest management. Lastly, Section 7 provides a summary of the findings and general conclusions of the study.

2. The current state of forest management adaptation in British Columbia, Canada

About two thirds of the province of BC is forested (BC Ministry of Forests, Mines and Lands, 2010). BC's forests provide a wide range of social, economic, environmental, and cultural benefits to

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