Forest Policy and Economics 61 (2015) 122–134

Contents lists available at ScienceDirect

Forest Policy and Economics

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

Combining scientific and stakeholder knowledge in future scenario development — A forest landscape case study in northern Sweden

Julia Carlsson *, Ljusk Ola Eriksson, Karin Öhman, Eva-Maria Nordström

Department of Forest Resource Management, Swedish University of Agricultural Sciences, S-901 83 Umeå, Sweden

ARTICLE INFO

Article history:
Received 16 December 2014
Received in revised form 24 August 2015
Accepted 24 August 2015
Available online 9 September 2015

Keywords:
Ecosystem services
Forest management
INTEGRAL project
Participation
Participatory planning
Rural development

ABSTRACT

Northern Swedish forests provide multiple ecosystem services. Integrating these values into the forest planning process frequently requires that not only forest owners but also other stakeholders be involved. The objective of this study is to assess the potential of future scenario development as a tool in forest planning. In a case study of the Vilhelmina municipality in northern Sweden, forest owners and stakeholders were interviewed, and a workshop was held to discuss important factors for the future development of the local landscape regarding ecological, socioeconomic and political issues. Combined with a researcher-conducted process, this resulted in three alternative scenarios. We conclude that the scenario development process has produced information that can be used in forest planning. The participatory element of the scenario development process could be extended further to enhance communication, learning and knowledge exchange. The participants' contribution to the scenario construction could also be elaborated, e.g., by further involving stakeholders in the formulation of alternative future manifestations and in the elaboration of scenarios. To achieve this, it is necessary to adapt the quantitative methods to the participatory situation, to foster discussion qualities, to secure representation and increase motivation for participation in different ways.

1. Introduction

In northern Sweden, forests are valued for more than traditional timber production. They are also valued for biodiversity and nature conservation, water protection, cultural and social values related to forests, reindeer husbandry and climate adaptation (Sandström et al., 2011). These multiple ecosystem services are relevant to a range of different stakeholders including forest owners, forest industries, environmental and recreational groups, public authorities, non-governmental organizations, and the general public (Appelstrand, 2012; Nordström, 2010; Vainio and Paloniemi, 2012). The demands for these various forest ecosystem services are frequently in conflict, and as pressure on forest resources increases, the need for public participation in the forest planning[1] process is increasingly emphasized (Appelstrand, 2012; Sandström et al., 2011). The International Labour Organization defines public participation as "a voluntary process whereby people, individually or through organized groups, can exchange information, express opinions and articulate interests and have the potential to influence decisions or the outcome of the matter at hand" (ILO, 2000, p. 6). Mostert (2003) distinguishes stakeholder participation as more specifically referencing organized groups such as companies, NGOs, etc., which is more in line with how participatory processes have commonly been conducted for forest planning. According to the rich literature on the topic, the strengths of public and stakeholder participation in forest planning, decision-making and policy processes are numerous (Adger and Andrew, 2009; Beierle, 1999; Forester, 1999; Johnson et al., 2012; Sheppard, 2005). Participation strengthens the credibility, legitimacy and equity in decision-making processes and enhances the understanding of the perspectives of stakeholders and consequences of management alternatives. Ideally, participation can thus enhance trust-building, improve relations and establish an arena for conflict management as well as promote sustainable decisions and their implementation.

The Swedish political process is characterized by consensus-oriented approaches (Lijphart, 1998; Schartau, 2010), where interest groups act as consultation bodies for identifying and analysing policy problems (Ekelund and Hamilton, 2001), and for reviewing and implementing legislation proposals (Schlyter and Stjernquist, 2010). The Swedish examples of collaborative approaches being used to handle forest-related conflicts primarily concern already protected forest land (Zachrisson and Beland Lindahl, 2013) and the effects on participation within the Swedish forest certification process (Gulbrandsen, 2005). Landowners and policymakers need to develop new modes of governance and new decision support techniques for sustainable forest planning (Appelstrand, 2012; Hysing and Olsson, 2008). Different "hard" techniques have been applied to support participatory forest planning

* Corresponding author.
E-mail addresses: julia.carlsson@slu.se (J. Carlsson), ljusk.ola.eriksson@slu.se (L.O. Eriksson), karin.ohman@slu.se (K. Öhman), eva-maria.nordstrom@slu.se (E.-M. Nordström).

[1] Forest planning is defined here as the process of developing a forest plan; that is, deciding what management to apply where and when (Öhman, 2001).

http://dx.doi.org/10.1016/j.forpol.2015.08.008
1389-9341/

processes with varying results, e.g., Multi Criteria Decision Analysis (MCDA) (Nordström, 2010). However, there is clearly a need for both qualitative and quantitative methods that can be used in forest planning and policy making to incorporate stakeholder knowledge and opinions and integrate them in a meaningful way with quantitative models and expert knowledge (van Notten et al., 2003).

One such potential tool for forest planning is scenario analysis. Scenario analysis can be defined as a systematic method that explores the causal relationships, uncertainties and drivers of change that might influence a potential future (O'Brien, 2004; Reed et al., 2013; Shearer, 2005; Wollenberg et al., 2000). In this sense, a scenario does not aim to predict the future, but to describe plausible developments of what the future might hold (Kahn and Wiener, 1967). There are different types of scenarios: *explorative* scenarios, examining 'what could happen'; *normative* scenarios, examining 'what ideally should happen'; and *predictive* scenarios, examining 'what is likely to happen' (Börjeson et al., 2006). Scenarios can be constructed using qualitative and/or quantitative models including information on current as well as past conditions (Biggs et al., 2007; Börjeson et al., 2006; Volkery et al., 2008). A mixed methods approach is often used in scenario development combining qualitative methods of stakeholder involvement processes with quantitative modelling in order to test plausibility and secure robustness and consistency of the qualitative information (Alcamo, 2008; Amer et al., 2013; Kosow and Gassner, 2008; van Notten et al., 2003). Qualitative information on different views and values of stakeholders and quantitative approaches of numerical data of drivers and barriers can be complementary and strengthen each other when used together (Amer et al., 2013). Severally used, qualitative and quantitative approaches have both pros and cons. For instance, qualitative data is influenced by the composition of the involved participants (O'Brien, 2004), whereas quantitative scenario models can contain generalizations, estimations and assumptions that can only capture a part of the complex reality (Alcamo, 2008).

Further, scenarios are suitable to create deliberative engagement between multiple actors to reach shared solutions for the future (Celino and Concilio, 2010; Masini and Vasquez, 2000). Scenarios can support research and political decision-making, as well as facilitate public learning and discussion, with different degrees of stakeholder participation (O'Brien, 2004; Patel et al., 2007; Reed et al., 2013; Volkery et al., 2008). When local stakeholders are invited to contribute to the scenario development processes, they are more likely to accept and use the created knowledge and to adapt to changing conditions (Patel et al., 2007; Reed et al., 2013; Welp et al., 2006). Scenarios are more convincing, credible and legitimate if they have been developed by a broad range of policymakers, interest group representatives, academics and other participants (Volkery et al., 2008). The practical knowledge and experience of the local stakeholders help broaden the perspectives on complex, uncertain problems. By including stakeholders, relevant policy concerns can be effectively addressed in the scenario-building process. The scenario development process stimulates discussions and open thinking among participants about plausible land-use implications, bridging gaps between different actors, improving communication and collaboration (Shearer, 2005; Volkery et al., 2008). However, the whole scenario planning process does not have to be participatory (Wollenberg et al., 2000). Scientific and stakeholder knowledge can be combined to build relevant and robust scenarios (Reed et al., 2013; Welp et al., 2006). Typically, stakeholders are involved in the first and final stages of scenario development, concerning problem formulation, evaluation and the selection of scenarios, and when using the final outcome in decision-making (Kok and van Delden, 2009; Reed et al., 2013).

Even if empirical research investigating how stakeholders assess landscape scenarios and alternative futures for rural areas is growing, more knowledge is needed on how to effectively conduct participatory processes in scenario development (Soliva et al., 2008; Volkery et al., 2008). Furthermore, in Sweden, participatory scenario development processes have only been applied in cases of environmental quality objectives (Höjer et al., 2011), water management (Franzén et al., 2011) and climate change adaptation (Carlsson-Kanyama et al., 2013) but not to forest management (Kleinschmit et al., 2012).

In this paper, we combine stakeholder and scientific knowledge according to the definition of science-based dialogue by Welp et al. (2006 p. 172), which is described as "a structured communicative process of linking scientists with selected actors that is relevant for the research problem at hand", focusing on securing certain competencies rather than securing full representation of interests. Accordingly, the scientists' understanding of a local issue is deepened and the social relevance of the research is validated. Integrating stakeholder and scientific knowledge can "provide a more comprehensive understanding of complex and dynamic socio-ecological systems and processes" (Reed, 2008 p. 2417). Here, we define scientific knowledge as more general and expert-oriented in different societal areas, whereas stakeholder knowledge is expert knowledge on the local situation and relations.

The objective of this study is to assess the potential of scenario development as a tool for participatory planning by combining scientific and stakeholder knowledge for analysing the future of a forest landscape. Local stakeholders are involved in the identification of ecological, socioeconomic and political factors relevant to integrated forest management at the landscape level in a case study of the Vilhelmina municipality in northern Sweden. Alternative future developments of these same factors are then explored by scientists and a number of consistent scenarios are defined for the next 30 years.

More specifically, this study focuses on assessing:

- if and how the scenario development process can combine stakeholder and scientific knowledge to construct scenarios;
- to what extent stakeholder knowledge and opinions were incorporated and contributed to the formulation of the scenarios; i.e., what was the level of stakeholder participation in the scenario development process; and
- if and how the scenario development process can result in something beneficial for local participants, bridging gaps between interests and actors, and facilitating communication, learning and knowledge exchange.

2. Material and method: the scenario development process

The scenario development process can be organized into different steps (Börjeson et al., 2006; O'Brien, 2004; Schoemaker, 1993), and usually contains five major steps (Kosow and Gassner, 2008): 1) identification of scenario space, 2) identification of key factors, 3) analysis of key factors, 4) scenario generation, and 5) scenario transfer for analysis and use in various contexts.

This study is part of the INTEGRAL project (www.integral-project.eu), studying policy processes for integrated management of European forest landscapes in ten different countries with 20 case study areas in total. The general guidelines for scenario development were developed by the researchers in INTEGRAL, which form the basis for the methodology applied in this study. As an adaptation to the methodology used and for increased clarity, the scenario development process applied in this paper has been divided into six steps (Fig. 1): 1) Definition of scenario space, 2) Identification and selection of key factors, 3) Description of alternative future manifestations, 4) Consistency analysis, 5) Clustering coherent combinations, and 6) Elaboration of scenarios. The steps will first be described generally, followed by a case study section describing in more detail how we conducted the steps in the Vilhelmina case study area. The scenario transfer will be conducted in later stages of the research process outside the scope of this paper.

In this study, the Parmenides Eidos™ software (www.parmenides-foundation.org) was used for the visualization and computation of the relationships and outcomes between different variables in the scenario creation. Parmenides Eidos™ was used in the structural analysis (step