



## Deconstructing a complex future: Scenario development and implications for the forest-based sector

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### ABSTRACT

This paper set out to review future-oriented projects to determine how the use of scenarios may affect EU forest-related policy. The work was carried out as a desktop study, utilising online search engines and databases to select appropriate future-oriented projects for analysis. The screening resulted in 36 case studies, most of which focused on scenarios for the environment, biodiversity and climate change but also covering territorial development, urban development, energy and transport. Only 2 case studies focused exclusively on forests. Most scenarios were developed to provide policy recommendations, they have as such, irrespective of the approaches and storylines used, in many cases influenced policy developments in Europe. The clearest example being that of climate and energy policy targets. The results demonstrate that most scenario frameworks are still not generating integrative visions of the environment that include forests in its entirety, reflecting sectoral fragmentation at the EU level. Forest-related scenarios will have to become more integrative to explore opportunities for policy actions aiming for a more sustainable future. This would require that future scenarios coherently assess impacts across sectors and adequately address the wide (and increasing) range of demands being placed on our forest resources.

### 1. Introduction

Informed decision-making requires information from both past experiences and knowledge about the future. While the future can be difficult to predict, one way to analyse it is to use scenario-planning methods. Scenarios can be used to manage complexity and examine uncertainties over long time periods that allow researchers to more accurately perceive future possibilities (Chermack et al., 2001; Börjeson et al., 2006; Amer et al., 2013; den Herder et al., 2014), such as checking if targets will be met (e.g., carbon emission targets) or analyse cause-effect relationships (e.g., driving forces affecting forest ecosystems) (Rounsevell et al., 2006; Briner et al., 2012). Scenarios are a focus in this article as they also symbolise the priority-setting process. More specifically, scenarios are a reflection of sectoral, public and other development priorities (Kankaanpää and Carter, 2004; Bizikova et al., 2014; Joshi et al., 2015; Kröger and Schäfer, 2016), in particular as they explore possible, probable or preferable futures (Van Der Heijden, 1996, 2000; Carter and LA Rovere, 2001; Kok et al., 2007). Understanding the narratives being expressed through scenarios can consequently clarify how forests (both present and future) are perceived.

There are today many methods that are used to explore “preferable”

futures (e.g., increased biodiversity) or to plan for “probable” futures (e.g., climate change) as well as “possible” futures (e.g., high unemployment). Scenario planning is therefore a useful tool for practitioners and policy-makers in the forest-based sector as they help to structure and define future policy objectives, prepare strategies for varied future realities as well as identifying obstacles and/or opportunities presented by different future pathways (Godet and Roubelat, 1996; Porter et al., 1997; Roubelat, 2000). The premise for using scenarios is basically to reduce uncertainty and allow for policy-making based on the best available information and data. For the purposes of this paper, alternative future developments that will be pursued through policy provide a snapshot of prevailing societal preferences (e.g., sectoral, consumer, public) that will shape how forest resources may be utilised.

Scenario planning for the forest-based sector implies the development of a framework from which future socio-economic and environmental issues, such as land-use, spatial distribution of forests and landscape aesthetics can all be considered. For instance, climate change, land abandonment and rural depopulation are examples of drivers that may change the provision of ecosystem services (Verburg et al., 2006, 2010). Questions related to how these drivers remain

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prevalent (or if new drivers could emerge) is of central importance when considering future developments (Rounsevell et al., 2006; Setten and Austrheim, 2012; Kraxner et al., 2013). Scenarios are particularly relevant for the forest-based sector as it is dynamic and constantly affected by numerous (often conflicting) driving forces (e.g., agricultural practices, demographic change and the demand for renewable energy) that can interact in unpredictable ways (Briner et al., 2012). Decision making for forests is furthermore characterised by plans covering long time spans across various spatial scales implemented on the local, regional, national and international level (Wolfslechner and Seidl, 2010; Hoogstra-Klein et al., 2017). This means that forest-related scenarios should be capable of modelling long production periods in managed forests of 100 years and more, re-iterate changing environments (e.g., climate change), interact with changing societal demands on forests and be responsive to the needs of forest managers in anticipation of possible, probable or preferable developments. All of these factors combine to introduce a high degree of uncertainty (Kraxner et al., 2013; Hurmekoski and Hetemaki, 2013; den Herder et al., 2014; Seidl et al., 2016) and means that any scenario analysis is based on incomplete knowledge (Briner et al., 2012). This is inevitable (as the future is uncertain) but it emphasise the degree to which scenario planning is susceptible to biases as they build on existing knowledge, preferences and past experience (Franco et al., 2013; Bradfield et al., 2016).

A prospective view on forest management and scenario planning (Aggestam and Wolfslechner, 2013) provided the initial impetus for this paper which has the objective to review how scenarios relate to and affect the European forest-based sector. This forms the basis for the main question, namely, to answer how accurately scenarios reflect (or not) varying policy perspectives and what the implications may be for forest policy. This is a pertinent question for the forest-based sector in the European Union (EU) as it is a policy domain that is characterised by a lack of competence (Aggestam and Pütlz, 2018; Aggestam et al., 2017). This paper consequently differs from other scenario-related reviews (e.g. Amer et al., 2013; Hurmekoski and Hetemaki, 2013; den Herder et al., 2014; Hauck et al., 2015; Hoogstra-Klein et al., 2017) in that the emphasis is on the implications of scenario development for the forest-based sector rather than the purely technical aspects thereof.

## 2. Approach

The review of scenarios deemed relevant to the forest-based sector was carried out as a desktop study, utilising online search engines and databases to identify suitable case studies.

The first step focused on identifying such studies by means of screening online databases and libraries, such as: CORDIS (see <http://cordis.europa.eu>); the European Environment Agency (see <http://www.eea.europa.eu/publications>) and the United Nations Environment Programme (see <http://www.unep.org/publications/>). This screening of numerous projects and reports applied the following criteria:

- Completed within a set 15 year period (2000–2015 period).
- Dedicated at least one substantive section to scenarios and/or scenario development;
- Has a European and/or Pan-European focus<sup>1</sup>;
- Has a significant degree of relevance for the forest-based sectors (see step 2).

Cases were identified using an iterative list of 17 search terms, including “forests”, “forest management”, “land-use”, “renewable energy”, “ecosystem services”, “nature conservation/restoration” and “biodiversity”,<sup>2</sup> with projects and/or reports also included iteratively

<sup>1</sup> Exceptions were made for projects and/or reports using internationally recognised scenario families.

<sup>2</sup> The search terms were also coupled together with “scenarios”, “foresight” and

based on references in the literature. The outcome of this screening process can be found in Appendix A which presents a complete list of the selected projects and/or reports.

The second step of the analysis focused on determining the relevance of the collected material. This was achieved by posing three dichotomous (yes/no) questions:

1. Do forests occupy a central position in the project and/or report?
2. Does the issue of mountains and/or lowland areas occupy any position in the document?<sup>3</sup>
3. Does timber production, carbon sequestration, nature conservation or protection against gravitational hazards (or related topics) occupy any position in the document?

Each “yes” resulted in a point being added to the project and/or report and yielded a relevance score of 0 (no relevance) to 3 (high degree of relevance). The relevance score allowed the analysis to focus on a limited number of scenarios in relation to the study objectives and to rank the overall connection between the aim of the scenario and the forest-based sector. The final list of projects/reports thus utilised should for this reason not be considered as an exhaustive list.

The third step was to re-read and analyse all the prioritised documentation to define in more detail how the scenarios related to forests (e.g., energy and biodiversity focus), a process which entailed:

- Characterising the overall **purpose** the scenarios (e.g., thematic focus and aim).
- Defining the **driving forces** applied in all the scenarios (e.g., climate change or populations densities).
- Determining the **spatial** and **temporal scales** used in the scenarios (e.g., global scenarios covering the next 20 years).

Driving forces associated with the scenarios were documented using the STEEP typology, which covers socio-cultural, economic, environmental, technological and political driving forces. This provided a straightforward approach for categorising all the driving forces (Bowman, 1998). All the resultant information was then collated in an excel sheet to provide a concise overview of all the data from the analysis.

The fourth and final step focused on reviewing all the collected data on the scenarios (purpose, driving forces and spatial/temporal scales) to better understand how they are linked to forests and the forest-based sector. The objective was to determine the future pathways that respective scenarios can create for the forest-based sector (e.g., possible implications from a renewable energy perspective). This was a qualitative exercise designed to link the scenarios to EU policy and then explore the consequences that respective scenarios may have for forest-related policy-making in the EU.

## 3. Results and analysis

The results below are presented in two distinct parts. First, a brief introduction is provided highlighting some information on the types of and associated characteristics of the scenarios that were included in the analysis. Further information on this portion of the analysis can be found in Aggestam and Wolfslechner (2013). Second, and most importantly, how the scenarios are linked to the forest-based sector is clearly demonstrated.

(footnote continued)

“forecasting” during the screening, e.g., forests + scenarios.

<sup>3</sup> Question 2 was specific to the project deliverable for which the data was originally collected. It has no direct relevance to the current paper (see Aggestam and Wolfslechner (2013)).

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