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SWOT analysis and strategy development for forest fuel supply chains in South East Europe

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ABSTRACT

The objective of this study is to assess drivers and barriers to primary forest fuel (PFF) supply in the wide-stretched South East Europe (SEE) countries and to develop strategies to improve PFF supply involving dozens of stakeholders from different SEE countries. SWOT (strengths, weaknesses, opportunities and threats) analyses were used to evaluate country supply chains. Based on those a regional SWOT analysis was compiled and strategies were developed and evaluated in a participative decision process. Results show that strategies for increasing biomass utilisation are of high relevance in all participating countries. Additionally, strategies for knowledge dissemination are also important. The evaluated regional strategies for the forest fuel sector examined have great potential to improve cooperation, increase efficiency and strengthen competitiveness of PFF based bioenergy production.

1. Introduction

South-East Europe (SEE) is maybe the most heterogeneous and complex area in Europe (South East Europe Transnational Cooperation Programme, 2015), made up of a broad mix of countries covering diverse primary forest fuel (PFF) supply chains and therefore offering an interesting study object for evaluating strategic frame conditions and PFF supply strategies on country as well as SEE level.

There are different definitions on South East Europe, the one of the South East Europe Programme (South East Europe Transnational Cooperation Programme, 2015) includes 16 countries (Albania, Austria, Bosnia and Herzegovina, Bulgaria, Romania, Croatia, the former Yugoslav Republic of Macedonia, Greece, Hungary, Serbia, Montenegro, Slovakia, Slovenia, the Republic of Moldova, parts of Italy (e.g. the Province of Bozen) and the Ukraine). Countries included in the EU's SEE programme have significant differences in economy and culture but are characterised by geographical proximity, increasing integration and historical ties.

PFF is the main source for bioenergy in South East Europe (SEE) and stimulates rural development by providing a local source for energy, reducing environmental impact and substituting fossil fuels and therewith CO_2 emissions. In SEE the forested area, and accordingly potential biomass sources, is increasing by 0.7% per year (AEBIOM, 2013). Biomass is the major source among renewable energies, accounting for almost 62% of the EU's renewables and showing steady growth (AEBIOM, 2013). Energy production from solid biomass as well as proven and intended contribution of renewable energies to the national energy system of selected SEE countries are presented in Table 1. The Renewable Energy Directive (2009/28/EC) targets to derive 20% of the EU's final energy consumption from renewable sources by 2020. In order to achieve this, individual targets for each EU member state

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Table 1
Selected data describing SEE energy systems. It shows the gross inland energy consumption of different SEE countries, the energy production from solid biomass, as well as proven and intended contribution of renewable energies to the national energy system according the Renewable Energy Directive (2009/28/EC). Available data for non-EU states are fragmentary, this applies particularly to Bosnia Herzegovina. (Countries: AT ... Austria, BA ... Bosnia Herzegovina, GR ... Greece, IT ... Italy, RO ... Romania, RS ... Serbia, SK ... Slovakia, SI ... Slovenia; RES … renewable energies).

	AT	BA	GR	IT	RO	RS	SK	SI
EU-member	X		X	X	X		X	X
Non-EU-member		X				X		
Gross inland energy consumption 2012	1.412 PJ[b]	291 PJ[c]	1.158 PJ[b]	6.963 PJ[b]	1.481 PJ[b]	609 PJ[b]	699 PJ[b]	293 PJ[b]
Primary production of energy from solid biomass in 2012	201 PJ[d]		42 PJ[d]	303 PJ[d]	159 PJ[d]	44 PJ[d]	34 PJ[d]	23 PJ[d]
Target share of RES in 2020[a]	34%	40%	18%	17%	24%	27%	14%	25%
Share of RES in 2012	32.1%[b]		13.4%[b]	15.4%[b]	22.8%[b]		10.4%[b]	20.2%[b]
Share of RES in 2009	30.3%[b]	34%[c]	8.5%[b]	9.1%[b]	22.7%[b]	21.2%[c]	9.3%[b]	19%[b]

[a] According to the Renewables Directive (2009/28/EC) for EU member states and Energy Community Secretariat (2014) for BA and RS.
[b] Eurostat (2015).
[c] Energy Community Secretariat (2014).
[d] Excluding charcoal; Eurostat (2015).

have been defined. The non-EU countries within the observed area of this study, Bosnia Herzegovina and Serbia, are part of the Energy Community, which adopted the Directive 2009/28/EC, 2012. Thus, they also set renewable energy targets (Energy Community Secretariat, 2014; Banja et al., 2014).

Solid biomass is used predominately for heating: small scale residential heating as well as district heating. PFF as the most important solid biomass source includes all biomass assortments from the forest that are used to produce bioenergy. Typical assortments are traditional fuelwood, logging residues and low quality roundwood. A comprehensive overview of PFF assortments, procurement systems, transport and various supply chains provide Wolfsmayr and Rauch (2014).

However, while some SEE countries stick to very traditional PFF supply chains providing mainly firewood, others (i.e. Austria and Northern Italy) have established more sophisticated supply chains for bioenergy plants in the last decades (Spinelli et al., 2014, Gronalt and Rauch, 2007). Nevertheless, large bioenergy plants have recently been established elsewhere in SEE and accordingly larger biomass catchment areas are needed to supply these plants. Thus, strategic development of PFF supply chains gains in importance mainly due to the increasing logistic costs involved (Dornburg and Faaij, 2001). Additionally, markets for bioenergy are constantly growing (AEBIOM, 2013) and strategic analyses on supply chains are essential (e.g. for investment or supply chain design decisions), but still missing or poorly developed for most of the SEE countries.

The objective of this study is to assess drivers and barriers of PFF supply and to develop strategies to improve PFF supply chains involving dozens of stakeholders from different SEE countries in a participative decision process. Therefore, PFF supply chains were analysed to point out commonalities and differences and thus generate a regional SWOT analysis, which illustrates strengths, weaknesses, opportunities and threats (SWOT) relevant for entire SEE. Moreover, strategies supporting competitiveness of bioenergy production are developed and their importance for each country is discussed.

2. Literature review SWOT analysis

Within a bundle of methods available to improve the strategy development process, SWOT analysis is used most commonly. Basically it surveys internal strengths and weaknesses on the one side and external opportunities and threats on the other side. Moreover, it can be extended in order to provide a framework for deriving strategies based on promising combinations of found strengths, weaknesses, opportunities or threats (Lombriser and Abplanalp, 1998). SWOT analysis was originally developed as strategic business planning tool, but nowadays it is also successfully applied as a participatory planning method, since the SWOT process encourages discussion among interdisciplinary group members (Pickton and Wright, 1998). Furthermore, it channels expert discussion and interaction when participatory; in setting-up and during strategy prioritisation (Terrados et al., 2007).

Ranking the importance of different factors within a SWOT category (e.g. strengths) as well as ranking alternative strategy options is optional and can be done in a qualitative as well as a quantitative way. A simple way is by a judgement of the analyser(s) involved. However, extending a SWOT analysis with Multiple Criteria Decision Support (MCDS) methods allows a more systematic assessment of SWOT factors (Kajanus et al., 2012). A commonly used MCDS method is the Analytic Hierarchy Process (AHP) that uses a pairwise comparison of factors respecting strategies (Saaty, 1980). AHP assumes that factors operate independently from one another, which might not be true in every case. Thus, the Analytic Network Process (ANP) incorporates interdependencies among factors for assessing their relative importance (Catron et al., 2013). A further type of a hybrid-method combines SWOT with Stochastic Multicriteria Acceptability Analysis with Ordinal criteria (SMAA-O), which can handle both ordinal and cardinal preferences (Kangas et al., 2003).

SWOT analysis is a commonly used instrument of strategic planning, but often inadequate deployment leads to ending-up with long lists of general, sometimes meaningless, described factors. In such case, the later strategy development process is often not related to the SWOT output (Hill and Westbrook, 1997). Another drawback of SWOT is the qualitative character of the analysis, making results strongly dependent on the expertise and capabilities of the people involved (Kurttila et al., 2000). Furthermore, many SWOT analyses lack of ranking the importance of different factors within a category (Hill and Westbrook, 1997).

Within the discipline of forestry, SWOT was used to analyse the forest sector within a defined region in Switzerland to find strategies to improve the profitability of the wood supply chain (Oswald et al., 2004). Furthermore, it was used to map out timber mobilisation strategies in Austria (Rauch, 2007). Recently, SWOT was used to manage wildfire prevention in Spain (Marino et al., 2014). Beyond that, SWOT was used to provide a framework for the findings of a Delphi method and to develop strategies for forest owner cooperatives in the US (Blinn et al., 2007).

Kurttila et al. (2000) combined the SWOT analysis with AHP: SWOT provides the basic frame and the decision hierarchy, while AHP is used for quantitative comparison. This hybrid-method was applied to a Finnish case study on forest certification (Kurttila et al., 2000). It was also used for the strategic planning of natural resource management at the Finnish Forest and Park Service (Pesonen et al., 2001). Similar methods that combine SWOT with AHP had been used for different applications in forest management: to analyse perceptions of different stakeholder groups regarding forest fuel development in the Southern US (Dwivedi and Alavalapati, 2009), to examine the current state of forest owner cooperatives in Slovenia (Grošelj et al., 2011), to provide structured insight into cooperative use of forest machinery in Slovenia (Malovrh et al., 2012), to analyse developments in agroforestry in