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Research Paper

Current and potential use of forest biomass for energy in Tasmania



Andreas Rothe^{a,*}, Martin Moroni^b, Mark Neyland^b,
Matthias Wilnhammer^a

^a Faculty of Forestry, University of Applied Sciences Weihenstephan-Triesdorf, Hans-Carl-von-Carlowitz-Platz 3, 85354, Freising, Germany

^b Forestry Tasmania, GPO Box 207, Hobart, 7001, Tasmania, Australia

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ABSTRACT

Although Tasmania, Australia's southernmost state, has a large forest resource per capita there is no reliable information on the potential use of harvest residues, low quality logs or processing residues for energy production. In order to address the current knowledge gap we: i) quantified the current use and the potential sustainable supply of forest biomass in Tasmania, ii) compared those results with the use of forest biomass in Bavaria, a comparable state in Southeast Germany, and iii) analysed the low Tasmanian production of energy from forest biomass considering economic, legislative and social drivers. The current use of forest biomass for energy (400 kt y⁻¹ of bone dry material) represents about 6% of Tasmania's total annual energy supply. The potential supply of forest biomass for energy production is estimated at 1800 kt y⁻¹ of bone dry material equivalent to about 30% of Tasmania's current total annual energy supply. In contrast to Bavaria and other European countries, forest bioenergy production is small in Tasmania relative to the available resource and could be more than quadrupled from a resource availability perspective. A weak domestic market for energy wood leading to low prices, the lack of political stimuli and a low social acceptance are likely key factors. As a strong increase in market prices for forest biomass is unlikely, political incentives are necessary in order to increase the use of forest biomass. Addressing social acceptance will be a prerequisite for the success of initiatives or legislation to achieve this potential.

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* Corresponding author. Tel.: +49 8161 71 5970; fax: +49 8161 71 4526.

E-mail addresses: andreas.rothe@hswt.de (A. Rothe), martin.moroni@forestrytas.com.au (M. Moroni), mark.neyland@forestrytas.com.au (M. Neyland), matthias.wilnhammer@hswt.de (M. Wilnhammer).
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1. Introduction

Tasmania, Australia's southernmost state, has a large forest resource per capita. Although about half of the 33 000 km² total forest area is reserved the total annual harvest is still at about 5 hm³ (1 hm³ = 1 000 000 m³) of timber corresponding to 10 m³ capita⁻¹ [21]. In the past the majority of this harvest has been from native forests but in the future plantations will become the main source of timber. The bulk of the plantation estate in Tasmania and in fact throughout south-eastern Australia has been planted over the last 15 years, and whether it is managed for pulpwood or solid wood products this estate is currently some years from maturity. As the plantation estate matures, the potential harvest may increase [19].

The use of forest biomass for energy is comparatively small in Tasmania and restricted to domestic firewood and some industrial heating plants. Substantial uncertainties exist regarding the current use and the sustainable future supply of forest biomass feedstock for energy production in Tasmania. The last officially published figures on firewood use date back over 14 years [16] and a comprehensive study on industrial biomass use for energy production is not available. Several recent studies have investigated the potential use of biomass for energy in Australia. These studies were either relatively rough estimates covering large areas (whole of Australia), long timeframes (>20 years) and a wide range of possible feedstocks (e.g. Refs. [14,19]) or detailed estimates for a potential consumer considering the area and feedstock for a special purpose (e.g. Refs. [23,63]). There is no reliable information on the potential Tasmanian forest biomass for energy feedstock originating from forest management covering both public and private land.

In contrast to the situation in Tasmania, the use of biomass for energy has significantly increased in Europe over the last twenty years [20]. Sweden and Finland, two European countries with a large forest resource per capita, currently produce between 25 and 30% of their final energy consumption from (predominantly forest) biomass [4]. The increasing use of forest biomass for energy was stimulated by rising prices of fossil fuels and political support for renewable energy. As a consequence, the public and scientists are increasingly concerned about overexploitation of forests and strong competition between the material and energetic utilisation of wood from forests. Therefore several wood supply estimates have been conducted producing a comprehensive view of the wood supply potential for bioenergy production at the European (overview see Ref. [20]), individual nation and region within nation level (e.g. Refs. [30,32,62]).

In order to address the current knowledge gap about forest biomass for energy in Tasmania we undertook a study that:

- i) quantified the current use and the sustainable potential supply of forest biomass for energy production in Tasmania,
- ii) interpreted those results in comparison to Bavaria (a comparable state in Germany) and
- iii) analysed the differences considering economic, legislative and social drivers.

In this study the term “forest biomass” refers to all woody biomass generated directly by forest management (split logs,

other low quality logs, harvesting residues) and wood processing (e.g. shavings, sawdust, woodchips).

Tasmania can be seen as a case study for a region, where the use of forest biomass is marginal compared to the available forest resource. The results are intended to foster a better future utilization of forest biomass and wood in general, and to inform forest policy development and public discussions.

2. Material and methods

2.1. Current use of forest biomass for energy

Estimates of the volumes of wood-processing residues used for energy were based on oral or written interviews undertaken with representatives of the wood processing industry during May/June 2013 [44]. Between them, the participating companies were responsible for processing more than 90% of the total harvest in Tasmania at that time. The estimates for domestic firewood consumption were based on data from Driscoll et al. [16]; which were updated by Todd [56] and on unpublished data from a wood-heater survey performed by the Tasmanian Environment Protection Authority during the winter of 2011. Firewood consumption was estimated by multiplying the number of households using firewood as a main heating source with an average household consumption of 4.8 t y⁻¹ of air dry material and by multiplying the number of households using firewood as a secondary heating source (where firewood is used as a supplement to a different primary heating source) of 2.2 t y⁻¹ of air dry material.

2.2. Potential supply of forest biomass for energy

The potential supply of forest biomass for energy in the short term (over the next three years) was calculated separately for low quality logs and harvesting residues resulting from forest management of both native forest regrowth and plantations, and from wood processing residues (woodchips, shavings, sawdust). Material from oldgrowth harvesting was not included due to the low public acceptance of such harvesting and since oldgrowth harvesting is a very small proportion of the total harvest following signing of the Tasmanian Forests Agreement Act in 2013.

2.2.1. Native forest regrowth

For State forests the potential supply of low quality (pulp-grade) logs and harvesting residues from native forest regrowth was calculated for two main forest groups ‘Tall Native Eucalypt Forest’ and ‘Low Native Eucalypt Forest’ based on harvest areas and volumes per area. ‘Tall’ forests are defined as those over 34 m in height whilst ‘low’ forests are those from 8 to 34 m tall, in accordance with past practice [36,52]. Non-eucalypt species were not considered since they comprise <5% of the annual harvest. Future rates of harvest were based on the area of native forest regrowth harvested during the 2009/10, 2010/11, and 2011/12 Australian financial years (1 July – 30 June) derived from Forestry Tasmania's operational database. Forestry Tasmania is a government business enterprise charged with managing the production of timber from the State controlled production forests.

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