Estimating Woodfuel Resource Cost Curves

As a renewable energy source, woodfuel has an important role to play in helping meet Government climate change and sustainability targets. The woodfuel strategy adopted by Forestry Commission England supports delivery of these. It aims to sustainably utilise an additional 2 million 'green' tonnes of wood biomass a year - equivalent to 1 million oven dry tonnes (odt, wood with 0% moisture content). This is expected to save 400,000 tonnes of carbon per year from use of fossil fuels by 2020. Under-managed woodlands (UMW) - defined as those considered not currently in productive use - are the target source of this material.

Based upon applied spatial analysis, the estimated amount of woodfuel biomass most immediately available from UMW is 12% of the FCE target. This could potentially be increased by use of less common (and generally more costly) harvesting and extraction methods.

Background

Just under half of the final energy consumed in the UK (49%) is in the form of heat. Heat generation currently accounts for almost half (47%) of UK CO2 emissions.

Of the heat generated in the UK in 2009, about 14% of the total was from renewable sources. 77% of this came from woody and plant based biomass, with the largest proportion (39%) from domestic wood combustion.

Objectives

This study aimed to construct a resource cost curve for woodfuel supply from currently under-managed woodlands. The curve shows how the cost of supplying woodfuel changes as the quantity supplied changes.

Methods

Construction of a woodfuel resource cost supply curve involved three main preliminary steps:

- definition and identification of UMW
- classification of UMW with respect to major factors affecting the costs of harvesting and extraction to roadside
- estimation of potentially available biomass for woodfuel.

The major limiting factors considered were woodland size (data does not include ownership boundaries that would be needed to distinguish separately owned parcels), road access, and terrain (safe working slope for the chosen type of machinery) and soil conditions (risk of soil damage). Note that woodlands under 2ha were excluded, and also that gross estimates for biomass energy supply were derived that do not take account of energy use in harvesting, extraction and processing, or in road construction.

Findings

The results suggest that 117 thousand odt per year of woodfuel biomass from UMW can be harvested and extracted to roadside from UMW with existing road access, using two common harvesting extraction methods at a total cost of between £2.8 million and £6.3 million per year. This is equivalent to 2.23 petajoules (PJ) at a cost of between £1.26 /GJ (low) and £2.84 /GJ (high).

If new access tracks (water bound macadam stone roads) up to 100 meters long from existing roads were constructed to woodlands currently lacking access, an estimated further 57 thousand odt per year (an increase of 49%) could be extracted at a cost (in the case of a 10-year scenario) of between £7.7 million and £9.5 million per year. This is equivalent to 1.09 PJ at a cost of £7.11 /GJ (low) to £ 8.69 /GJ (high).

The two major limiting factors on the potential availability of woodfuel from UMW were found to be access to woodland and high risk of soil damage. Due to lack of access the size of initial pool of UMW identified as a potential source of woodfuel was reduced by 53%. Large areas with a high risk of soil damage among UMW of 2 ha or more with road access reduced it by a further 58%.

Recommendations

To increase potential woodfuel supply from UMW consideration of the following is recommended:

- Constructing new access roads (an effective, if expensive, way of increasing potentially available biomass).
- Conducting further research and field trials on new techniques for working on sensitive soils.

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Reports and Publications

SARAJEVS, V. (2011). Estimating Potential Woodfuel Resource Supply for Under-Managed Woodlands in England. (Paper submitted to 'Biomass & Bioenergy', draft available from the author.)