

Opportunities for Biomass Production on Non-agricultural Land in the North East of England

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Bio-Land Biomass Crops on Non-agricultural Land

Following a meeting of interested parties at the University of Teesside on April 20 2009 it was agreed that a scoping document should be prepared to examine the potential availability of non-agricultural land in the North East for Biomass production.

1. Defining the outline scope of the project.

There is a need to define clearly the type of land that will be included in this study to enable an accurate assessment of its potential for biomass production. Brownfield has been defined in the *Brownfield Guide*¹ published by English Partnerships as previously developed land and buildings where reuse may in some way be constrained. Previously developed land is defined within the *Planning Policy Statement 3 (PPS3): Housing*. It is important to recognise that this definition excludes land which may be considered well suited to the production of biomass. For example, land that has been developed for minerals extraction or waste disposal by landfill where provisions for restoration has been made through development control procedures.

Local Authorities produce records of previously developed land, indicating, where possible, the likely future use for the land. This information is collated by the National Land Use Database and published by the Department of Communities and Local Government. The most recent data, published in August 2008² showed that the North East has a total of 4,000 ha of such land, one of the lowest of all the English Regions.

This report provides a comprehensive overview of the potential of this type of land for housing and industrial development, but gives no indication of the potential of any land for biomass production. Even using the most optimistic values for land that is “unused or may be available for redevelopment” the total for the region is 2,660 ha. The actual amount of land that could be devoted for biomass production is significantly less than this amount due to location and the area of each individual parcel of land being too small for commercial biomass production.

Brownfield land may also be recorded as Contaminated Land, defined by the Environmental Protection Act 1990 Part 2A³, which came into force in England in 2000. This Act defines contaminated land as “*any land which appears to the local authority in whose area the land is situated to be in such a condition, by reason of substance in, on or under the land that (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) pollution controlled waters is being, or is likely to be caused*”

The Environment Agency publishes statutory reports on the state of contaminated land in England and Wales under the Environment Protection Act

1990. Information is made available to the Environment Agency by Local Authorities; it is interesting to note that not all the Local Authorities in the North east submitted information for the most recent report. However, the Regeneration and Economic Development Unit at Durham County Council have produced a detailed map showing reclaimed and disturbed land throughout the county (Appendix 1).

2. Other Non-agricultural Land in the North East

In addition to 'previously developed land' there are other potential land categories which could be considered for biomass production within the region. This land, referred to as 'non-agricultural land' may either be in private or public ownership.

2.1 Closed Landfill Sites

Information provide by the Environment Agency indicates that there are 439 closed landfill sites in the north east. The highest concentration is located in Tyne and Wear (176) and the lowest in Cleveland (31). County Durham has 133 sites and Northumberland 99. The area of land represented by these sites has not however been recorded in the database.

Once a landfill site has ceased to accept waste the Environment Agency continues to be responsible for ensuring that it presents no health or other environmental risk. Once this has been satisfactorily achieved the site will then be returned to the original owner of the land which may be a Local Authority, a private land owner or a commercial organisation. Site restoration requires planning agreement with the local council and this will include the proposed use of the land. In the majority of cases the land is returned to grass, or may be incorporated into a wildlife sanctuary. Local communities are generally hostile towards landfill sites and their restoration to green field land is much vaunted, often to the point where any further site activity is viewed with great suspicion.

2.2 Restored Colliery Sites

Closure of the deep pits throughout the north east in the late 1980s resulted in significant amount of brownfield land becoming available for regeneration. Wherever possible this land was used for urban redevelopment and every opportunity was taken to promote commercial activities on site to create alternative employment opportunities. This work was financed by the Coalfield Regeneration Trust in collaboration with English Partnerships (now part of Homes and Communities Agency)⁴. The target set by the Government for the north east was to bring 4,000 ha of derelict and contaminated land back into use.

Whilst the highest priority was given to homes and commercial premises the creation of open public spaces was also considered a high priority activity. This programme of work is now in its final phase and although a number of projects

are underway (Seaham Colliery, Weetslade Colliery site in North Tyneside) there appears to be very little opportunity for the inclusion of biomass crops as part of ongoing regeneration programmes. There may be small pockets of land that could be developed for SRC production, but are likely to require further reclamation activity to make them suitable. Soil acidity and lack of organic matter is a major problem on many of the old colliery sites, on the other hand, these edaphic conditions have given rise to areas of land much valued for their high levels of biodiversity and are therefore unlikely to be considered for biomass production.

2.3 Restored Opencast Land

Opencast coal mining operations have been undertaken throughout the north east, especially in Northumberland. Land taken for opencast operations are either rented or purchased from the landowner. Following coal extraction the land is replaced according to strict planning regulations, part of which defines the post-restoration management of the land. Normal practice is to return the land to agriculture, although occasionally the land may be sold for leisure or other activities. A suitable grass sward is established hedges are re-instated, trees planted and a new drainage system installed. After a period of time the land may be used to grow arable crops, especially cereals and oilseed rape.

Current opencast sites in the north east are operated by UK Coal and the Banks Group. These sites on completion of the coaling operations will return to agriculture and although the land would be suitable for biomass production the enterprise would be assessed on its individual merits.

2.4 Mineral Workings

These sites are not generally restored to agriculture with the exception of surface worked sand quarries. Grassland is normally established on these sites although the productivity of the land is usually very low and could be considered for biomass production.

2.5 Great North Forest Land

The Great North Forest was established as a partnership between private landowners and Local Authorities to provide public access. Approximately 2,000 ha of land has been planted throughout the north east since its inception. The Organisation which promoted these activities is no longer active and the responsibility for managing the forest areas has been passed on to the Forestry Commission who have indicated that there is unlikely to be any land available within the Great North Forest for biomass production.

3. Suitable Biomass Crops for Restored Sites

Other than the on-going trials at Teesside University there are no reported studies on the performance of different biomass crops in the North East. The Centre for Renewable Energy from Land (CREEL), Newcastle University are currently negotiating the lease on a 35 ha former opencast site to establish large scale plantings in 2010 of a wide range of energy crops to compare their productivity and suitability for both biomass and biofuel end uses.

A number of field studies comparing the growth different energy crops on good agricultural land have, however, been undertaken nationally by ADAS, Rothamsted Research Station, and commercial organisations. From current evidence it would appear that willow coppice is the most attractive crop across the north east. Commercial crops of Miscanthus have been established in Yorkshire, but the climate in the north east is generally regarded as been well below the optimum for efficient production. Reed Canary Grass is a crop with considerable potential, but its production potential is yet to be determined in the region. An extensive area has been established on a farm in North Yorkshire for the production of biomass pellets.

The performance of different biomass crops on non-agricultural land has yet to receive a great deal of attention although a number of studies on willow coppice have been reported and early indications from WRAP sponsored Trailblazer projects have been published.

4. Biomass Market in the North East

The North East of England Plan Regional Spatial Strategy to 2021, published in July 2008⁵ recognises biomass as the region's second most significant renewable energy resource having a key role in supporting rural recovery and developing sustainable communities. Further analysis of future energy requirements of the region are provided in the Technical Background Draft paper No 7, which identifies Short Rotation Coppice (SRC) as one of four wood fuel feed stocks.

Northwoods in a recent report⁶ maintain that the biomass sector contributes at least £40 million to the north east economy and has a potential to generate at least £76 million per year by 2015. Currently there are three major biomass users in the region, Alcan at Blyth using wood derived fuel, Sembcorp' wood burning power plant on Teesside and the Kielder District Heating Scheme in Northumberland. Egger at Hexham is also a major user of wood for chipboard manufacture.

Production of biomass from energy crops on agricultural land in the region is at a very low level at around 200 ha of SRC having been established to date.

Approximately half of this area is contracted to Sembcorp with the remainder grown under contract to Coppice Resources Ltd (CRL). Ushaw College, Durham has recently established 10 ha of SRC for their own use. Land Remediation Services LTD with support from the WRAP Trailblazer project have established approximately 15 ha willow coppice on three closed landfill sites managed by Premier Waste Management in Durham.

The demand for biomass from SRC far outstrips the output from established crops. Sembcorp alone have indicated that they have an annual requirement for 30,000 odt of SRC which at 8 odtt/ha/yr equates to approximately 3,750 ha. Drax in North Yorkshire are aiming to consume 375,000 odt from energy crops by 2011, approximately 40,000 ha for co-firing. A proportion of which could be grown in the south of the region. Clearly these power plants together with Alcan will dominate demand and set the price for SRC biomass locally. It must also be recognised that there will be an increasing demand from local authorities for biomass fuel to heat schools, offices and leisure facilities. Energy for the recently opened swimming pool in Hexham is provided from wood fuel. Further demands for wood fuel will arise from local industries as the economics of the carbon levy become a reality.

5. Regional Stakeholders

Alcan contact Bob Nicholson
bob.nicholson@alca.com

Biomass Energy Register (BEn) contact Katarzyna Zielewska
Katarzyna.Zielewska@ruraldevelopment.org.uk

CLEMANCE, University of Teesside contact Richard Lord
r.lord@tees.ac.uk

Coppice Resources Ltd contact Barbara Hilton
Barbara.hilton@coppiceresources.co.uk

Country Landowners Association contact Angus Collingwood-Cameron
angus.Collingwood-Cameron@cla.org.uk

Durham County Council contact Ged Lawson
ged.lawson@durham.gov.uk

Egger	contact John Patterson john.paterson@egger.com
Environment Agency	contact joanne.cooper@environment-agency.gov.uk
Forestry Commission	contact Richard Pow richard.pow@forestry.gsi.gov.uk
Land Remediation Services Ltd	contact Robin Twizell robin@landremediationservices.co.uk Eric Evans eric@landremediationservices.co.uk
Newcastle University	contact Paul Bilsborrow p.e.bilsborrow@ncl.ac.uk
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North Energy	contact Nicola Smith nicola@northenergy.co.uk
Northwoods	contact David Clubb david.clubb@ruraldevelopment.org.uk
Northumberland County Council	contact Mike Jeffrey 01670 534085
Renew at cpi	contact Chris Hayward chris.hayward@renew-cpi.com
Renewable Energy from Agriculture	contact Robin Twizell robin@refa.org.uk
Renewable Fuels	contact Bob Smith bob.smith@renewablefuels.co.uk
Sembcorp	contact Barbara Hilton barbara.hilton@sembcorp.co.uk

Soil Environment Services	contact Robin Davies rd@soilenvironmentservices.co.uk
The North East Biomass Forum	contact Ben McLaughlin Ben.McLaughlin@onenotheast.co.uk
Wood Energy Ltd	contact Ben Tansey ben@woodenergyltd.co.uk

6. Relevant Studies and contacts

BioReGen Life III Environment Project
CLEMANCE University of Teesside
Dr Richard Lord
r.lord@tees.ac.uk

Investigation of the production capabilities of energy crops on brownfield land. Additional support from WRAP to investigate the use of PAS 100 compost as a soil improver. Biomass crops under investigation include SRC Willow, Miscanthus. Reed Canary Grass and Switchgrass. The project is using five one hectare sites including a former shipyard at Haverton Hill, a capped slag heap at Tees Barrage, a former coke works at Binchester, a former sewage treatment works at Rainton Bridge and a former landfill site at Warden Law. Trial plots established during 2007, harvesting of the grass plots commenced in 2008.

BIOREM 11 Phytoremediation of Arable Sludged Soils (PASS)
University of Nottingham/Severn Trent water/Land Research Associates
Dr Scott Young
scott.young@nottingham.ac.uk

One of the LINK Bioremediation Programme started in 2001 to help provide UK industry with the multidisciplinary capability necessary to enable the commercial application of bioscience for the clean-up of contaminated land, air and water.

This project is designed to measure the phytoextraction capabilities of different plant species in accumulating trace metals from land treated with sewage sludge. SRC willow was included as one of the plant species under investigation.

Final report not yet published

Centre for Renewable Energy from Land (CREEL)
Newcastle University
Dr Paul Bilsborrow
p.e.bilsborrow@ncl.ac.uk

Proposal to establish 35 ha of trial facilities to evaluate the performance and productivity of a range of perennial crops for energy production. The restoration of this land is currently underway and it is envisaged that planting will commence in 2010.

Markham Willows Masterplanning
AEA Technology Environment Harwell, Didcot
Julian Wilczek, AEA Technology

Confidential report prepared for exSite.

Restoration of the 106 ha coal spoil tip at the former Markham colliery site. Restoration includes the use of additional organic matter, sewage sludge and compost to grow coppice willow.

Regeneration of Brownfield Using Sustainable Technologies (ROBUST)
University of Durham, School of Engineering
Dr Johnson, School of Engineering and Dr Bambra, School of Geography.

EPSRC Challenging Engineering Award within the Institute of Hazard and Risk in association with iKnow, the new Beacon Centre for NE England. Aim to develop field equipment for fast and safer data collection on contaminants at brownfield sites.

Rejuvenate EU Project
University of Reading r3 Environmental Technology
Professor Paul Bardos
p-bardos@r3-bardos.demon.co.uk

A combined UK, German, Dutch and Swedish programme, funded under the ERA-Net SNOWMAN by DEFRA and the EA started in October 2008.

Waste and Resources Action Programme (WRAP)
Project ORG059 - Support for Trailblazer Sites Using Compost on Brownfield Land.
Paul Mathers, WRAP The Old Academy, 21 Horse Fair Banbury
paul.mathers@wrap.org.uk

Two further projects using PAS 100 compost have been supported by WRAP to investigate biomass production within the Trailblazer Projects.

1. Former landfill sites at Lumley and Coxhoe, County Durham.

Commercial plantings of willow coppice on 15 ha of land on two Premier Waste Management's closed landfill sites in 2007 and 2008 using PAS 100 compost to improve soil conditions. Different rates of compost applied and either worked into the surface or used to form compost beds. Good establishment was achieved on some plots, but the use of deep compost beds was less successful. These sites have been planted and maintained by Land Remediation Services Ltd eric@landremediationservices.co.uk

2. St.Ninians Opencast site, Kelty, Fife, Scotland

No reports yet available

Further projects are due to commence during 2009 which will examine the use of compost to establish willow and other energy crops on brownfield sites. The first, Fordsham Deposit Grounds, is a former disposal site for material dredged from the Manchester Ship canal on which will be planted. The second is a CLEMANCE Project at the Corus Steel Plant, Redcar where Reed Canary Grass will be established.

7. Additional Contacts

British Land Reclamation Society

Interdisciplinary organisation and a registered charity concerned with the reclamation, regeneration and restoration of land. This includes contaminated, derelict and abandoned land from mineral working and former urban and industrial uses.

British Urban Regeneration Association (BURA)

Formed in 1990 to provide a forum for the exchange of ideas, experience and information for the emerging regeneration sector.

Contaminated Land Applications in Real Environments (CLAIRE)

Organisation promoting cost-effective land remediation techniques under real site conditions for the benefit of the UK economy and environment.

Contaminated Land Assessment and Remediation Research Centre (CLARRC)

Multidisciplinary research centre based at the Universities of Edinburgh and Napier. It aims to develop technologies for sustainable, cost-effective assessments and remediation of contaminated environments and promotes its transfer to industry.

Clean Environment Management Centre (CLEMANCE)

Multidisciplinary research group based in the University of Teesside to develop and support clean technologies to improve the competitiveness of the region's industry and benefit people and their environment.

Department of Communities and Local Government

Government Department responsible for communities to provide safe, healthy and sustainable environment for all.

Forest Research

The research agency for the Forestry Commission. UK's principal organization for forestry and tree related research, providing technical advice on establishing greenspace on brownfield, degraded and contaminated land.

Homes and Communities Agency (HCA) *Previously English Partnerships*

National housing and regeneration agency for England, formed in December 2008 as a non-departmental public body sponsored by the Communities and Local Government Department.

Land Restoration Trust

A partnership comprising Homes and Communities Agency, Groundwork, Forestry commission and the Environment Agency to tackle enduring dereliction across England.

Natural England

Responsible for the Energy Crop Scheme in England. All plantings of Miscanthus and SRC are supported at a rate of 40% of actual planting costs

North East Contaminated Land Forum (NECLF)

A voluntary organization run by north east of England regulators, developers, consultants, contractors and academics with interest in contaminated land.

Network for Industrially Contaminated Land in Europe (NICOLE)

A forum on contaminated land management in Europe, promoting co-operation between industry, academia and service providers on the development and application of sustainable technologies.

7. Useful Publications

French, C.J. Dickinson, N.M. and Putwain, P.D. (2006)

Woody biomass phytoremediation of contaminated brownfield land.
Environmental Pollution 141 387-395

Laureysens, I, Bogaert, J Blust, R and Ceulemans, R (2004)

Biomass production of 17 poplar clones in a short-rotation coppice culture on a waste disposal site and its relation to soil characteristics. Forest Ecology Management 187 295-309

Paulson, M Bardos, P Harmsen, J Wilczek, J Barton, M and Edwards, D. (2003)

The practical use of short rotation coppice in land restoration
Land Contamination and Reclamation 11 323-338

Rawlinson, H Dickinson N. Nolan, P and Putwain P. (2004)

Woodland establishment on closed old-style landfill sites in N.W.England.
Forest Ecology management 202 265 – 280

8. References

1. English Partnerships (2006) The Brownfield Guide – a practitioner's guide to land use in England 7pp.
2. Communities and Local Government (2007) General Land Use Database Statistics for England 2005. 13 pp
3. Defra (2008) Guidance on the legal definition of contaminated land 14pp.

4. English Partnerships (2004) The national Coalfields Programme – the national regeneration agency support real and long-lasting transformation of the coalfield communities. 6pp.
5. One North East (2007) Regional Economic Strategy Action Plan – revised sustainability appraisal report 107 pp
6. Northwoods (2008) Strategic regional biomass fuel supply. IEA Biomass Conference 14 slides

9. Bio-Land Group Members

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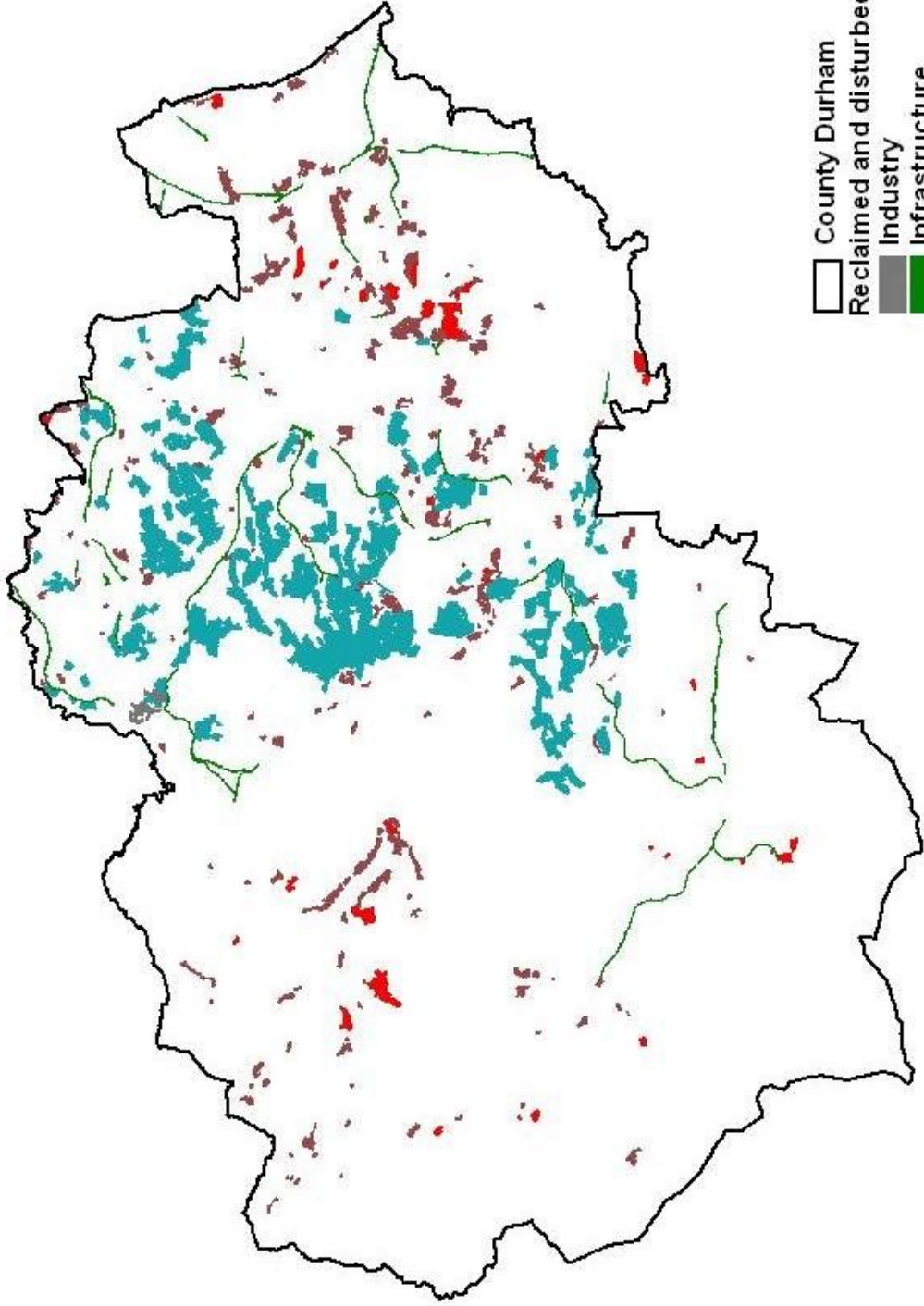
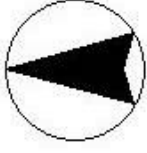
Eric Evans
Bio Recycling Solutions Ltd July 2009

Appendix 1 Reclaimed and Disturbed Land in County Durham

Information kindly supplied by Ged Lawson, Senior Landscape Architect, Durham County Council.

Contact : ged.lawson@durham.gov.uk

Tel : 0191383



- County Durham
- Reclaimed and disturbed land: origins
- Industry
- Infrastructure
- Mineral working
- Mineral working: active
- Open-cast coal