District Eating
Turning kilowatt hours into food and flowers

MIDLANDS NET ZERO HUB

Midlands Net Zero Hub

Horticultural Waste and Energy Mapping Study

WP2: Micro-feasibility studies

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1.0 Introduction

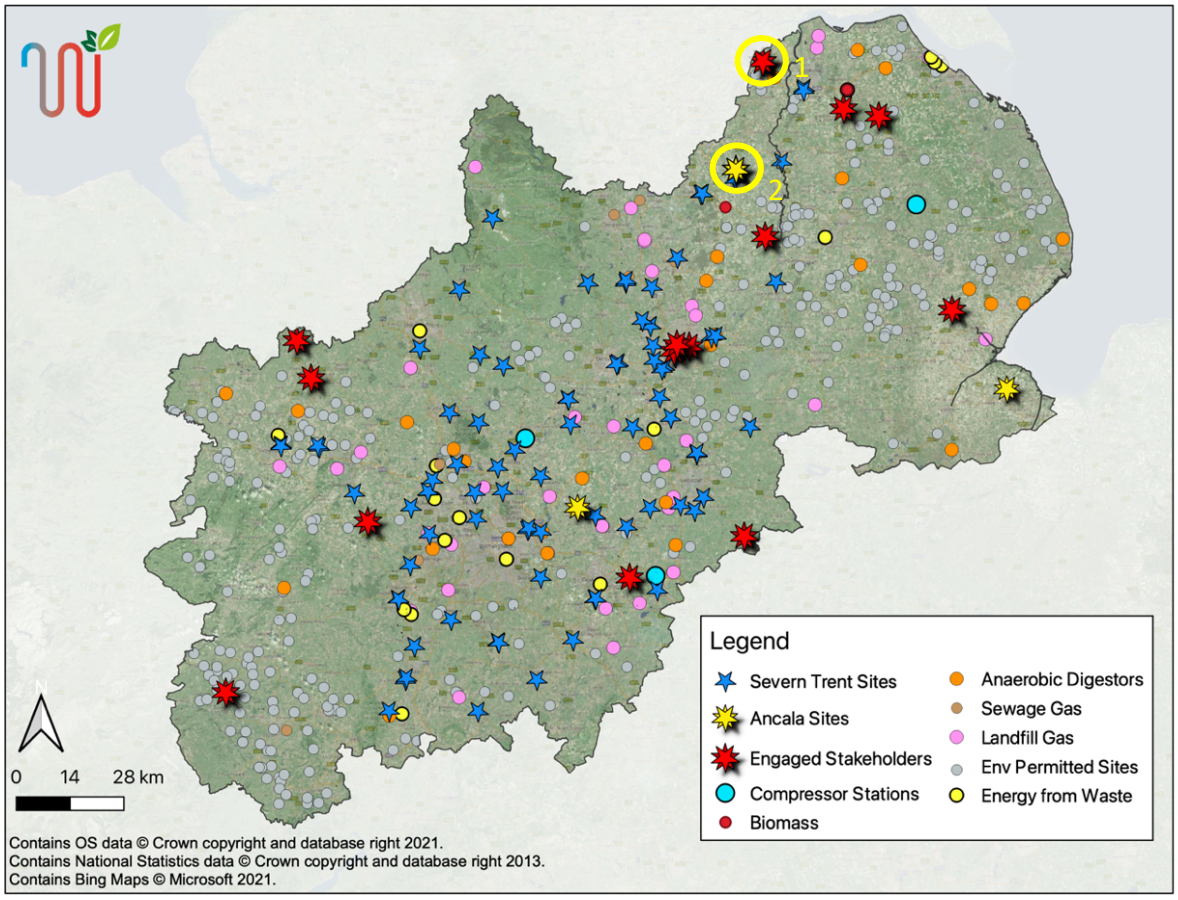
1.1 Background

District Eating Ltd (DEL) was commissioned by the Midlands Net Zero Hub (MNZH) to conduct three micro-feasibility studies for horticultural projects using waste heat. Throughout November 2021 – January 2022, DEL carried-out stakeholder engagement and mapping of actors within the agri-food sector in the MNZH region. This led to a shortlist of sites, of which three were selected for micro-feasibility studies for low-carbon horticulture using waste heat. This could produce fresh, low-carbon, hyper-local food as well as introducing advanced controlled environment agriculture (CEA) to the Midlands. Low-carbon horticulture has the potential to provide training and employment opportunities and contribute towards rural economies and the integration of green space into urban spaces in the Midlands.

1.2 Site Selection and Project Outline

Work Package 1 resulted in the selection of three sites for micro-feasibility studies. The selected sites are shown below, along with a summary of the business proposal for each. The third site was originally intended to be an urban waste-water treatment site, however upon further engagement with key stakeholders it emerged that the power generation onsite would not be sufficient for vertical farming. Rather than proposing another small-scale greenhouse, DEL decided to investigate the potential for vertical farming at a generic site with renewable electricity generation.

1. A 3Ha greenhouse using heat from an anaerobic digestor in North Lincolnshire growing flowers and strawberries.
2. A 1.5 Ha greenhouse using heat from biomass boilers in North Lincolnshire growing organic tomatoes, with potential to expand to 4.5 Ha.
3. Vertical Farming at a generic site with renewable electricity generation.



2.0 Opportunities

2.1 Co-location of Horticulture with Sources of Waste Heat

In the UK, heating and lighting costs are the most significant outlay for greenhouse horticultural businesses. Depending on the fuels used for supply of heat and power, horticulture often has a high carbon footprint. This means that fresh produce imported from warmer climates overseas can often be more cost efficient and lower carbon than locally grown produce[1]. Co-locating horticulture with sources of waste heat and CO_2 can bring down the operational costs of running a greenhouse and allow British growers to compete with imported produce in terms of carbon footprint, making local produce more sustainable and economically viable.

Through co-location of horticulture with waste heat from industry and elsewhere in the agri-food supply chain, there are win-win scenarios for both the heat supplier and the growers:

- The heat supplier generates an income from heat that was previously being wasted, gains an anchor load on the district heat network, and reduces their return temperature which can improve the overall efficiency of the heat network system.
- The grower gets access to a large amount of heat, a consistent supply, and can negotiate a competitive price.

[1] https://link.springer.com/article/10.1007/s11367-013-0576-2

2.2 Food Security

Growing food locally increases the resilience of the supply chain. Recent research has shown that a third of the UK's fruit and vegetables are imported from climate-vulnerable countries[2]. Domestic production of fruit and vegetables in the UK decreased from 42% in 1987, to 22% in 2013[2]. The negative impacts of heatwaves and extreme rainfall events are likely to increase, in line with the Intergovernmental Panel on Climate Change (IPCC)'s predictions of 'more frequent and more intense extreme weather events due to global warming'. Increasing local production through urban farming is a vital way to ensure food security as the impacts of climate change and Brexit become apparent.

3.0 Job Creation & Social Benefit

All three business plans outlined in the micro-feasibility studies will create job and training opportunities in the Midlands. This, and other methods of maximising social benefit, can create a wider economic impact when taking into consideration local job production, opportunities for training and education, and creating a wider skill base. The potential social benefits to the projects can be evaluated and quantified using the Social Value Portal National TOMs framework.

Key areas of social benefit associated with low-carbon horticulture are:

- Job Creation – including growers, apprenticeships, maintenance. Creation of jobs could provide support for local area and boost local economic growth. Moreover, the creation of new jobs in agriculture could bring a new skillset to the area, especially for the younger generations.
- Social prescribing – Spending time in green spaces and working in sociable environments have been scientifically proven to improve mental health and well-being. Accommodating for social prescribing, for example through volunteering groups, could mean a boost of support for people suffering in your local area and an opportunity for people to visit a green space.

The National TOMs (Themes Outcomes and Measures) is a framework managed by an organisation called Social Value Portal[3]. Social value can be expressed in financial terms which allows comparison with other initiatives – these measures are known as proxy values. The social value in these projects would arise through training apprentice growers. Under the National TOMs framework, reducing CO_2 emissions against a business-as-usual scenario could add further social value to the project. A summary of the relevant NTs, or National TOMs, is shown below, courtesy of Social Value Portal.

[2] https://www.lshtm.ac.uk/newsevents/news/2020/one-third-uk-fruit-and-vegetables-are-imported-climate-vulnerable-countries#:~:text=on%20the%20rise-,One%20third%20of%20UK%20fruit%20and%20vegetables%20are%20imported%20from,this%20is%20on%20the%20rise&text=The%20UK's%20supply%20of%20fruit,new%20study%20in%20Nature%20Food

[3] https://socialvalueportal.com/national-toms/

Table 1: Extracts from National TOMs Database, courtesy of Social Value Portal

Measure	TOMS reference	Social value	Units
Number of local employees	NT1	£30,353	per person
Number of employees from long term unemployment	NT3	£18,965	per person
Armed forces veterans			
Homeless employees			
Mothers returning to work			
Survivors of modern slavery			
Number of employees who are not in Employment, Education or Training	NT4	£13,636	per person
16-25 y.o. care leavers			
Number of 18+ ex-offenders	NT5	£23,119	per person
Number of disabled employees	NT6	£15,166	per person
Hours spent on educational school and college visits	NT8	£16	per staff hour
Weeks of apprenticeships offered	NT10	£207	per week
To disadvantaged people (see NT3)			
Relating to the low carbon economy			
Supporting young people into work	NT11	£126	per attendee per hour
Weeks of meaningful unpaid work placements	NT12	£158	per week
Weeks of meaningful work internships paying real living wage	NT13a	£315	per week
Savings in CO2 emissions on contract achieved through de-carbonisation	NT31	£70.43	tCO2e

4.0 Commercial Options for Delivery

There are several fundamental considerations in determining the most appropriate commercial delivery route for the low-carbon greenhouse projects set out in the micro-feasibility studies. These include:

a) The client's view on project risk and the extent to which it wishes to outsource this,
b) The aspects of this project which the client wishes to control for its duration,
c) The client's current and likely future capability and capacity to carry out activities "in- house", and
d) funding sources and availability for delivering the scheme.

Based on this, District Eating propose six delivery routes for greenhouse development.

4.1 Third Party Urban Farm Operating Company (UFCo)

In this option, a third party (District Eating or other third party) invests, owns, designs, builds, operates, maintains, and provides billing and customer services for the greenhouse. Services provided and billed to the client and other customers could include food production, and the value of CO_2 savings. Additional streams of income can be created through using the urban farm for social prescribing, apprenticeship provision, horticultural training, or workshops in health and wellbeing.

4.2 Third Party UFCo Adoption/Concession

Via a long-term concession agreement, a third party (District Eating or other third party) provides design input, adopts, operates, maintains, and provides billing/customers services for the greenhouse (as with 4.1 but for a set time frame).

Services provided and billed to the client and other customers could be the same as those outlined in the description of the Third Party Urban Farm Operating Company (UFCo) above in section 4.1.

4.3 Joint Venture UFCo

In this option, a private sector entity jointly invests and owns the greenhouse with one or more public or private entities. The joint investors will design, build, operate, maintain, and provide billing/customers services for the greenhouse project.

Services provided and billed to the client and other customers could be the same as those outlined in the description of the Third Party Urban Farm Operating Company (UFCo) above in section 4.1.

An example of this could be District Eating joining forces with an investment company to build and operate the greenhouse and generate an income from the client for provision of fruit and veg, and for social services such as training for example.

4.4 Local Authority UFCo

Via an established special purpose vehicle (SPV), the client invests and owns the greenhouse. The SPV will design, build, operate, maintain, and provide billing/customers services for services provided through the project, usually via third party contractors (District Eating or other service provider). Services provided are billed to the client and other customers.

Services provided and billed to the client and other customers could be the same as those outlined in the description of the Third Party Urban Farm Operating Company (UFCo) above in section 4.1.

4.5 Crowd Funded Community Owned UFCo

Like the previous option, a special purpose vehicle (SPV) is established but this time the client owns a pre-decided percentage of shares. The client will develop a project either in house or through employing a third party (District Eating or other third party) to develop the project through the stages of feasibility. Once a project has been developed to the point of investment grade business case a 'Pitch Deck' can be created, and a crowd funding exercise can take place to raise funds for capital funding with each contributor owning a share in the project. The SPV contracts out the ongoing operation and maintenance of the horticulture project to a third party (District Eating or another provider).

Services provided and billed to the client and other customers could be the same as those outlined in the description of the Third-Party Urban Farm Operating Company (UFCo) above in section 4.1.

4.6 Client Self Delivery

The client invests, owns, designs, builds, operates, maintains, and provides billing/customers services for the greenhouse, usually via third party contractors (District Eating or other service provider).

Services provided and billed to the client and other customers could be the same as those outlined in the description of the Third Party Urban Farm Operating Company (UFCo) above in section 4.1.

5.0 WP2 Outcomes

- Work Package 2 resulted in three micro-feasibility reports which estimate heat and power demand, outline capital costs, operational costs, income, financial viability, and carbon savings for horticultural projects.
- The result is three outline business proposals which can be adapted to various sites in the Midlands and beyond with waste heat and power.
- A key theme in across the three studies is how to create profitable horticultural business models in small areas of available land. This often involves selection of high value crops to make small-scale horticultural projects financially viable.
- The micro-feasibility studies are an outline first step towards developing horticultural projects. The next stage of work if any of the project are to progress will involve detailed feasibility work, which will verify all of the assumptions and benchmarks used in this initial high level work.