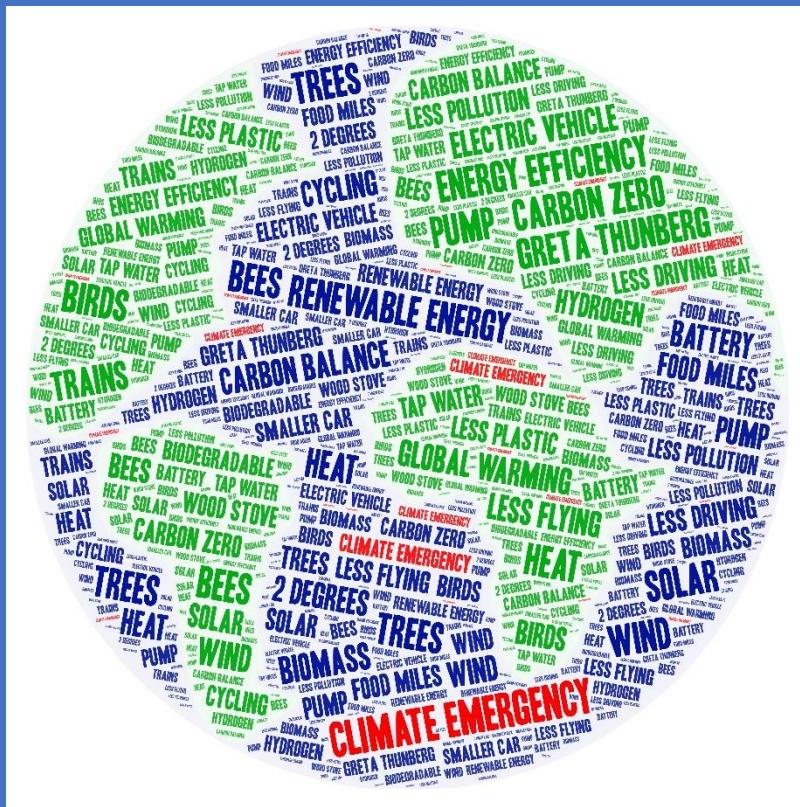


Humshaugh Net Zero



First Year Report

2020-2021

Summary

- Humshaugh Net Zero has been formed as a Community Interest Company by Humshaugh residents with the aim of achieving net zero carbon emissions by 2030.
- Current Humshaugh residential carbon dioxide emissions are about 5,000 tonnes of CO₂ *per annum*, with an additional 2,500 tonnes of CO₂e *per annum* due to agriculture.
- Achieving net zero carbon dioxide emissions will involve a combination of:
 - Increased carbon dioxide sequestration by woodland
 - Reduced household, transport-related and agricultural emissions
 - Access to genuinely low-carbon electricity, generated either locally or nationally, at a level that meets all the needs of Humshaugh
- Independent consultants have identified PV solar, wind turbines, electricity storage, heat networks and energy trading as priority areas for further evaluation in reducing the carbon footprint of Humshaugh.
- The community and key stakeholders both within and beyond Humshaugh are being engaged.
- Year 2 objectives will include:
 - An evaluation of the contribution of agriculture and non-residential properties to the carbon footprint of Humshaugh
 - Preparation of the first draft of a comprehensive action plan for achieving net zero by 2030 in consultation with the community and local and regional stakeholders, including: landowners, farmers, business enterprises, Humshaugh Parish Council, Northumberland County Council, Community Action Northumberland.



Our Carbon Footprint

Humshaugh household and agricultural emissions are 7,800 tonnes of CO₂e per annum

Humshaugh Parish has an area of 1,200 ha and in 2011 had a population of 622 living in 290 households. With subsequent developments households now number approximately 350. In 2020 Humshaugh Net Zero (HNZ) was established. HNZ is a *Community Interest Company* set up with support from Humshaugh Community Ventures Ltd. HNZ will evaluate how Humshaugh could achieve net zero carbon emissions by 2030 and develop and implement plans for so doing. HNZ membership is free and open to all residents of the Parish of Humshaugh.

A household carbon footprint survey was undertaken by HNZ, in association with Newcastle University, which estimated total Parish emissions at 5,300 tonnes of CO₂ per annum. The independent Impact Tool (<https://impact-tool.org.uk/>) estimates that total Humshaugh Parish emissions are 7,100 tonnes CO₂e per annum; however, this includes 2,500 tonnes CO₂e per annum from agriculture which was not independently estimated in the HNZ survey. Removing the contribution due to agriculture, which is comprised of greenhouse gas emissions from agricultural fuel, livestock and arable farming, the Impact Tool estimate of Parish emissions drops to 4,600 tonnes CO₂e per annum. The latter value is not inconsistent with the value of 5,300 tonnes of CO₂ per annum derived from the HNZ survey. See Figure 1 for the overall 2021 summary.

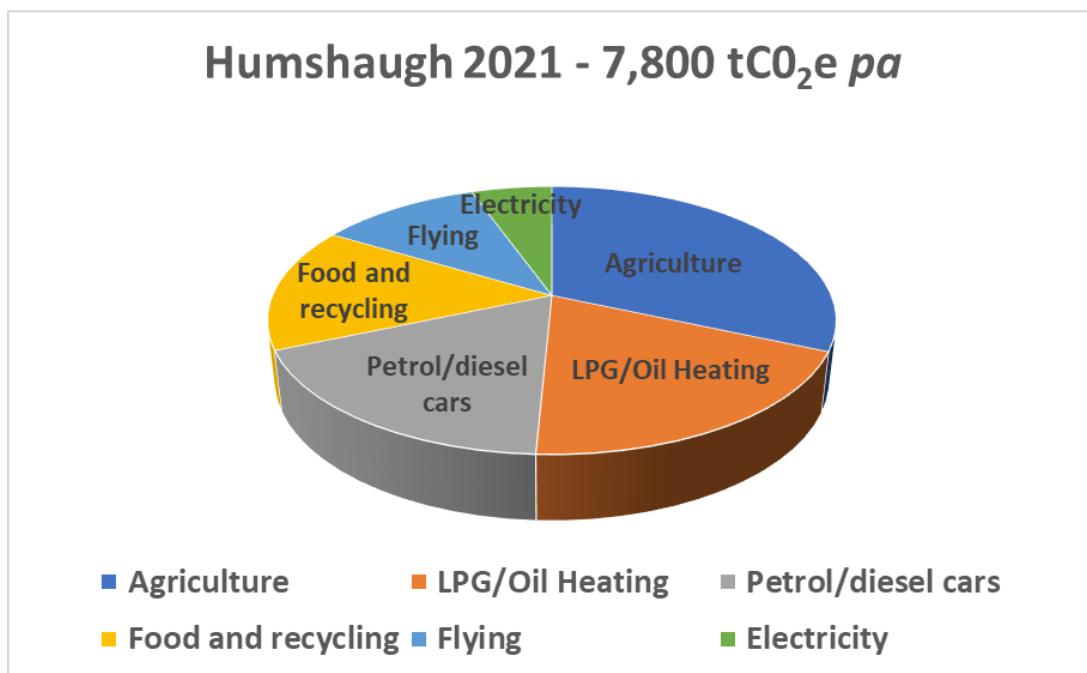


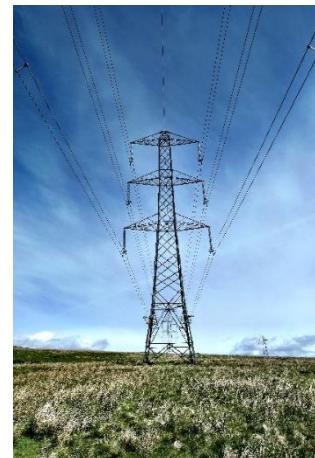
Figure 1: Humshaugh 2021 carbon footprint component estimate – Note: Emissions from non-residential premises and sequestration by existing woodland are not included.

Reducing the Carbon Footprint of Humshaugh

Carbon Dioxide Sequestration by Woodland

HNZ estimate that of the 1,200 ha that comprises Humshaugh Parish, some 80 ha are currently woodland. Even if trees in hedgerows and gardens are added, the area of woodland in the Parish is unlikely to exceed 100 ha. Values for CO₂ removal by woodland, termed “negative emissions” by Northumberland County Council, vary widely from 5 to 43 tCO₂/ha/year based on information from Forest Research, the Forestry Commission, the UK Government and Northumberland County Council. An average value for newly planted and well-managed woodland used by the Forestry Commission

is 10 tCO₂/ha/year over a 30-year period. Currently, existing woodland in Humshaugh may not be optimally managed for carbon dioxide sequestration and a value of 5 tCO₂/ha/year is perhaps more realistic (<https://www.woodlandcarboncode.org.uk/>), equivalent to 500 tCO₂/year for the total wooded area in the Parish.



Household Carbon Dioxide Emissions

Heating and electricity account for over one third of household emissions (36% or 1,900 tCO₂/year - HNZ survey). A detailed CO₂ emission and energy survey has been undertaken on ten representative Humshaugh properties, based on which the following will be determined:

- The accuracy of existing EPCs (243 of ~350 households in the Parish have a current EPC).
- The utility of heating and electricity bills in calculating individual property CO₂ emissions.
- Improvements that will move properties into EPC band C or higher, the target set by the recent Government White Paper.

To fund house improvements to reduce CO₂ emissions the E.ON UK/Northumberland County Council Green Homes Grant scheme is being evaluated.

A particular challenge in Humshaugh is the large number of older stone properties, some of which are in a conservation area and/or are listed buildings. To address how the carbon footprint of such properties might be reduced whilst complying with planning constraints a further project is currently being undertaken by Newcastle University, in collaboration with Northumberland County Council, looking specifically at historic/listed buildings, and those in a conservation area.

Carbon Dioxide Emissions by Non-Residential Properties

Although it was originally intended that the carbon footprint of non-residential properties would also be determined, this was not undertaken due to the COVID pandemic. However, a detailed survey of Humshaugh First School has been performed and a decarbonisation plan is being developed, parts of which may be transferable to other non-residential buildings in the Parish.

Low Carbon Electricity and Heating Options

To evaluate low carbon electricity generation and heating options HNZ secured a £37,000 grant from the Rural Communities Energy Fund. A wide range of technologies have been investigated by independent consultants, i.e.: hydrogen, anaerobic digestion, photovoltaic panels (PV solar), wind turbines, heat pumps, heat networks, smart meters, smart trading and GRID services. Of these



photovoltaic panels, wind turbines, electricity storage, heat networks and energy trading are being evaluated in more detail.

Until such time as local generation is able to meet the electricity demands of the Parish, most likely by solar PV and wind turbines, the purchase of electricity from **genuinely** low carbon suppliers is encouraged. HNZ has produced a summary document to inform residents of those companies whose electricity is guaranteed to be generated from renewables, as opposed to those who claim to provide green electricity based on the increasingly discredited REGO scheme.

Transport-related Carbon Dioxide Emissions



Car use is responsible for 26% of Humshaugh household carbon dioxide emissions (1,400 tCO₂/year) and whilst walking, cycling and public transport use are to be encouraged, in a rural area such as Humshaugh most households will depend on private cars for the foreseeable future.

Fully electric cars are now a viable low carbon alternative to diesel and petrol cars, and HNZ has produced a short video that explains the benefits, practicalities and costs of driving an electric car. Supported by Northumberland County Council, the community EV charge point at the Village Hall continues to be invaluable for residents without off-road parking, and hence home charge points, and to visitors.

Emissions of Greenhouse Gases by Agriculture

Agriculture in the Parish is estimated to contribute 2,500 tonnes CO₂e per annum (<https://impact-tool.org.uk/>) with methane produced by ruminants in dairy and meat livestock likely to be a major contributor. HNZ has yet to undertake detailed work in this area; however, research options are emerging that may lead to reduced agriculture-related emissions. For example, supplementing livestock diets with certain compounds, some found naturally in seaweed, can drastically reduce methane production. Similarly, genetically engineered crops with markedly higher yields can reduce greenhouse gas production associated with arable farming.

A change to agriculture that is designed to have a major impact on greenhouse gas emissions is the Environmental Land Management scheme; the three components of which are the Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery (<https://www.gov.uk/government/publications/environmental-land-management-schemes-overview/environmental-land-management-scheme-overview>). However, details of the scheme are currently limited. Pilots are planned for 2021-22 with launches in 2022-24. Importantly, the top-level objective of the Environmental Land Management scheme is to support net zero by 2050, and hence the contribution of this scheme to achieving net zero by 2030 will probably be limited.

Engagement with the Community and Stakeholders

Notwithstanding the challenges of the COVID pandemic and consequent lockdown, HNZ managed to survey 30% of Humshaugh households to determine the carbon footprint of the Parish. This high level of engagement led to over 40 individuals becoming members of HNZ.

HNZ members are kept informed by Email, and the community engaged through quarterly newsletters, social and conventional media and an interactive website - <https://www.humshaughnetzero.org/>. Meetings are planned when COVID restrictions allow.

Landowners are a key stakeholder group who are contacted individually as reports are produced, with meetings again planned as soon as COVID restrictions ease. Humshaugh Parish Council are updated on progress at each of its meetings, and the Parish Council have declared a climate emergency. Beyond Humshaugh, HNZ are in close contact with the Climate Action Team at Northumberland County Council as part of the Climate Champions initiative, Community Action Northumberland, Newcastle University, and the Rural Community Energy Fund. Networking with other local climate action groups is also developing. The companion Community Conservation Humshaugh group has been formed which is working to promote conservation and biodiversity within the Parish.

Objectives for Year 2

A Milestone-driven Action Plan for Net Zero Carbon Humshaugh by 2030

The key objective for Year 2 will be to develop a milestone-driven action plan for delivering net zero for Humshaugh by 2030. In addition, business cases will be developed for each component. The plan will be open for widespread community discussion and submitted to Humshaugh Parish Council and the Climate Action Team at Northumberland County Council. The possibility of Humshaugh becoming a “demonstrator project” for the County Council is being explored. Also in Year 2, the contribution of agriculture and non-residential properties to our carbon footprint will be explored as a prelude to developing detailed plans to reduce greenhouse gas emissions by these sectors.

Initial views on a route to Humshaugh Net Zero

Reducing Carbon Emissions is Challenging not Impossible

Non-agricultural emissions in the Parish of Humshaugh are approximately 5,000 tCO₂/year based on the HNZ survey and the independent Impact Tool, with the latter estimating agriculture-related emissions at 2,500 tonnes CO_{2e} per annum.



Current woodland sequestration is probably in the region of 500 tCO₂/year (<https://www.woodlandcarboncode.org.uk/>), although further advice is being sought to confirm this value. If the area of woodland were increased 2.5-fold to 250 ha (i.e. to ~20% of the total area of the Parish) and all the woodland managed optimally, overall sequestration would rise to 2,500 tCO₂/year. However, it is likely that until 2030 the majority if not all of the sequestration due to woodland will be required to offset the 2,500 tCO_{2e}/year produced by agricultural activities.

Assuming that carbon sequestration by woodland in the Parish will not contribute significantly to offsetting household emissions (currently 5,000 tCO₂/year) before 2030, even approaching net zero will be extremely challenging.

If household emissions due to electricity, space and water heating were reduced to an average of 1 tCO₂/year, the 350 households in the Parish would emit ~350 tCO₂/year. The recent HNZ detailed survey of representative properties has shown that, through a combination of air and ground sourceheat pumps, biomass boilers, improved insulation and low carbon electricity, reducing household emissions due to heating and hot water to less than 1 tCO₂/year is not impossible. However, access to genuine low carbon electricity, either generated locally or supplied nationally,

will be critical to reducing electricity, space and water heating related emissions to less than 1 tCO₂/year per household.

Reducing the 1,400 tCO₂/year that is due to car use will require a substantial switch to electric vehicles; only 1/179 cars in the HNZ survey was fully electric. Assuming that the level of car ownership is the same in the Parish overall as in the 30% of households surveyed, there are about 600 cars in the Parish. To reduce the carbon footprint due to cars, for example to 150 tCO₂/year – 10% of the current level, the number of petrol/diesel cars will need to be reduced by approximately 90% by 2030, equal to some 55 electric vehicles replacing 55 petrol/diesel cars each year. As sales of new petrol and diesel cars will be banned from 2030, the move to electric vehicles is likely to accelerate over the next ten years.

For petrol, diesel and hybrid vehicles that are already owned, carbon dioxide emissions are directly related to annual mileage. Based on HNZ survey emission data, the current average mileage of the 600 cars in the Parish is 8,500 miles *per annum*. For vehicles that travel <500 miles each year, given the lower carbon dioxide emissions associated with low mileages, replacement with an electric vehicle in the short term is less of a priority. To reduce annual mileages, particular for those who commute to centres where multiple residents work, car-sharing is an attractive option. Importantly, access to genuinely low carbon electricity will again be critical to maximising emissions reduction due to car use. Unless fossil fuels are removed from the supply chain that provides electricity to Humshaugh, the full potential of electric vehicles in cutting carbon emissions will not be realised.

Air travel is a significant component of the carbon footprint of Humshaugh residents at 16% or 850 tCO₂/year (HNZ survey). Within the next 10 years electric-, hydrogen- and biofuel-powered planes are unlikely to make a significant contribution to air travel emission reduction. The COVID pandemic has resulted in a marked decline in passenger air travel, but whether this is maintained post-COVID remains to be seen. In the short to medium term, i.e. before 2030, the only viable solution to aviation-related emissions is to reduce air travel which decreased business travel post-COVID may help to achieve.



The final component of the carbon footprint of Humshaugh is food and recycling, which is estimated to be 22% or 1,200 tCO₂/year (HNZ survey). A detailed analysis of how food and recycling contribute to greenhouse gas emissions is needed, along with the potential for reducing emissions through community initiatives such as communal composting and local recycling points. To ensure there is no “double counting” of emissions in the food chain, research is needed to determine if the reduction of

local agricultural emissions by woodland development within the Parish would offset emissions due to household food consumption in any meaningful way.

Recommendations

In summary, based on work done by HNZ in the first year, the following actions could contribute to Humshaugh achieving net zero by 2030:

1. Planting 150 ha of new woodland, to establish 250 ha in total in the Parish, to mitigate current greenhouse gas emissions due to agriculture.
2. Reducing household space- and hot water-related emissions to an average of 1 tCO₂/year *per household* through a combination of improved insulation, air and ground source heat pumps, biomass boilers and low carbon electricity. This level of emission will require approximately ~80% of properties having non-fossil fuel boilers by 2030, which equates to changing heating systems in about 30 households *per year*.
3. Moving to electric vehicles as the predominate car type, for example 90% of all cars by 2030, which is equivalent to 55 petrol/diesel cars being replaced with electric vehicles *per year* on average.
4. Promoting walking, cycling and public transport as an alternative to car use, and establishing car-sharing as an option for commuters.
5. Obtaining access to genuine low carbon electricity at a level sufficient for all household and car transport needs, for example increasing provision by 20% each year. Low carbon electricity could be generated locally by wind and/or PV solar, or provided by national suppliers. Local storage, smart metering, necessary GRID access and appropriate trading mechanisms will be critical to achieving this objective.
6. Encouraging long distance rail and electric vehicle travel as an alternative to flying thereby reducing emissions by, for example, 20% each year; until such time as low-carbon aviation fuels are developed, and by continuing the use of virtual meetings in the business sector.
7. Once understood in more detail, decreasing greenhouse gas emissions due to agriculture and from non-residential properties.

As presented numerically in Figure 2 and illustrated in Figure 3, the above recommendations would together reduce the carbon footprint of the Parish of Humshaugh to less than 1,000 tCO₂ *per annum* by 2030. This residual level of emissions could be mitigated by planting an additional 100 ha of woodland sequestering 10 tCO₂ *per annum*, or further reductions in emissions by the residential, business and/or agricultural sectors.

Acknowledgements

Humshaugh Net Zero are extremely grateful to Dr Hailey James for her invaluable assistance in producing this report, and to Ian Birleson for undertaking data analysis and generating figures. The support of Humshaugh Community Ventures Ltd in establishing HNZ is much appreciated, as is grant funding awarded by the BEIS-funded Rural Community Energy Fund (RCEF), which is managed by the North East Yorkshire and Humber Energy Hub and administered by Tees Valley Combined Authority. HNZ are also grateful to the Climate Action Team at Northumberland County Council, Community Action Northumberland, and colleagues at Newcastle University for their support.

Contacts

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Category	Measures to reduce carbon emissions	Emissions per annum – tonnes CO ₂ e									
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Agriculture	16 Additional hectares of well managed woodland planted <i>per annum</i>.	1454	1293	1131	970	808	647	485	324	162	1
LPG/Oil Heating	30 Additional homes replacing LPG/oil central heating boilers with heat pumps or biomass boilers <i>per annum</i>.	1486	1359	1231	1104	977	849	722	594	467	340
Petrol/diesel cars	55 Petrol/diesel cars replaced by electric cars <i>per annum</i>.	1380	1254	1127	1001	874	748	621	495	368	242
Food and recycling	20% Reduction in emissions by efficiency improvements <i>per annum</i>.	1168	934	748	598	478	383	306	245	196	157
Flying	20% Reduction in flights or of emissions by efficiency improvements <i>per annum</i>.	849	679	543	435	348	278	223	178	142	114
Electricity	20% Increase in the use of genuinely green/low carbon electricity <i>per annum</i>.	425	340	272	218	174	139	111	89	71	57

Figure 2: Illustrative measures to reduce the carbon footprint of the Parish of Humshaugh, and the impact of the measures on estimated carbon emissions in each category.

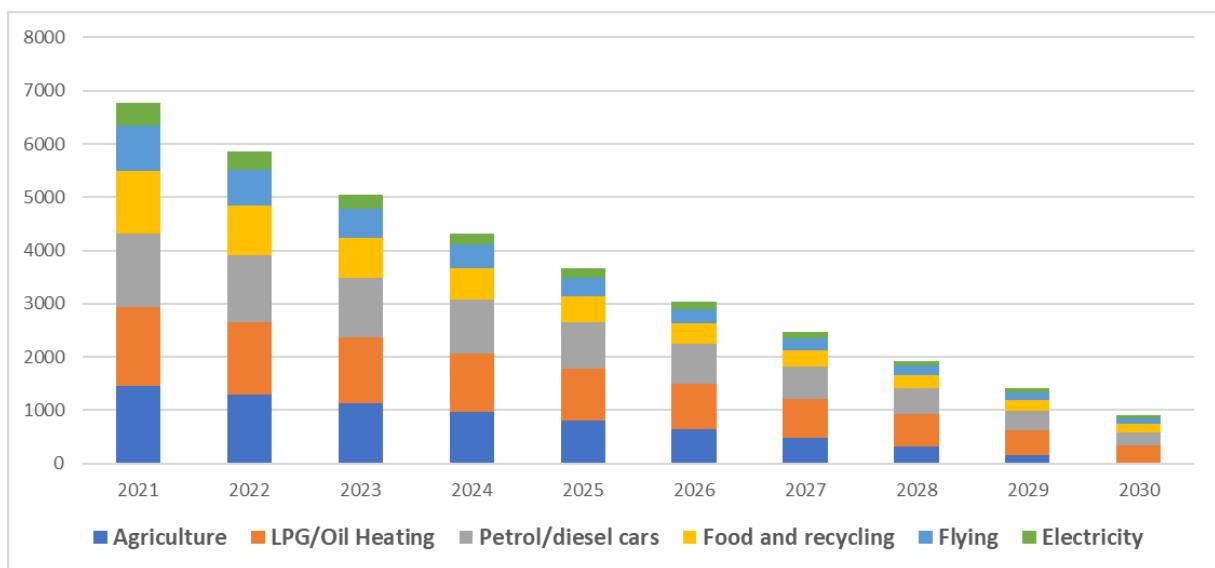


Figure 3: Graphical representation of the impact of the measures shown in Figure 2 on carbon emissions (tonnes CO₂e) each year in the Parish of Humshaugh.

