

TREES TO BUILD



'Glamping Pod' - located at the Grassland Centre in Aberbargoed. A prototype that brings together a contemporary design led approach to utilising local timber for value added products for the benefit of environment, people, and local communities. Project managed by - RDP Cwm a Mynydd timber project - Client – CCBC Park Cwm Darran - Larch felled by - John Whitehead – FLS Tree Care Ltd. Poplar felled by - Gerald Pool Tree Surgery - Milled by Martin - Frazer mobile sawmill - Designed in collaboration with Luke Palmer - Built in collaboration with Mike Venables.

Richard Edwards – Land Economist. January to November 2021.

BACKGROUND.

The 'Trees to Build' project aims to utilise trees growing on land owned and managed by Caerphilly County Borough Council (CCBC), to provide timber, roundwood (small poles) and sawmilling by-products that can be used in local construction projects and for day-to-day works by the Council's parks department.

This work forms part of a wider ambition framed within the 'Wood Lab Pren Project', which seeks to develop localised timber and wood-product supply chains across South Wales. The Wood Lab Pren Project receives funding from the Cwm a Mynydd Project (1), a co-operative-based partnership between Coed Cymru, Caerphilly County Borough Council, Blaenau Gwent County Council, Merthyr and RCT LAG and others.

Since 2014, the Cwm a Mynydd Local Action Group has approved over £800,000 of funding from the Cwm a Mynydd LEADER Implementation Fund to eligible projects. These funds are provided through the Welsh Government Rural Communities - Rural Development Programme 2014-2021, which is funded by the Welsh Government and the European Union (2).

The specific areas of focus for the report are:

- Identifying barriers in the local timber supply chain and develop solutions to overcome these problems.
- Research new markets and develop innovative methods of using the local timber and facilitate product development.
- Cost-compare price of operation against bought-in timber from current CBCC timber supplier.

Through site observations, discussions and recording the supply-chain process, this report details the costs incurred in harvesting 75.80m³ of hybrid Larch (*Larix x eurolepis*) growing on Parc Penallta (Hengoed, Caerphilly) (3).

(1). <https://your.caerphilly.gov.uk/cwmamynydd/our-projects/timber-project>

(2). <https://www.caerphilly.gov.uk/News/News-Bulletin/July-2020/Rural-Development-group-calls-for-new-projects-in>

(3). <https://greenspacescaerphilly.co.uk/parc-penallta/>

INTRODUCTION:

The 'Wood LAB Pren' project, administered by Caerphilly County Borough Council, aims to deliver against the needs and opportunities identified within its Local Development Strategies (4), and the Welsh Government Rural Development Program 2014-2020 (5), which seek to create resilient rural enterprises and more efficient, localised supply chains throughout Wales.

The project aims to provide technical and business support to the forestry/timber sector by promoting best-practice of forest management and reducing the inherent risks associated with product and supply chain development. More efficient supply-chains can improve issues associated with sustainability, particularly in relation to greenhouse gas emissions, and could lead to the creation of jobs in local communities.

With restrictions in place through Brexit regulations, and increased inspections of dock-landed (imported) timber that can potentially carry insect and fungal-related disease into Wales, the need to manage our wooded-land resources more efficiently and effectively is a priority.

Perhaps most importantly, trees, within woodlands, plantations and road-edges, will need to be managed to avoid the impact of climate-breakdown, while also being managed within more progressive land-use systems that enable greater volumes of greenhouse gases to be sequestered through biomass (wood and leaf) and soil. Research from Europe and the USA already indicates that natural structures of native woodland and unnatural structures of conifer plantations are likely to change through higher seasonal temperatures, prolonged periods of drought and more persistent periods of rain (6)

The management of existing woodlands and plantations, sitting alongside new areas of tree-based systems that are more efficient at capturing greenhouse gases, are now firmly positioned within a range of 'Natural Climate Solutions' (7) and Negative Emission Technologies (8) that are being promoted by the Intergovernmental Panel on Climate Change (IPCC) (9) to encourage more effort to sequester greater volumes of greenhouse gases from the atmosphere.

(4) <https://www.caerphilly.gov.uk/Business/Planning-and-building-control-for-business/Local-Development-Plan>

(5) <https://gov.wales/rural-development-programme-document-2014-2020>

(6) <https://science.sciencemag.org/content/368/6494/eaaz9463>

(7) <https://www.conservation.org/blog/what-are-natural-climate-solutions>

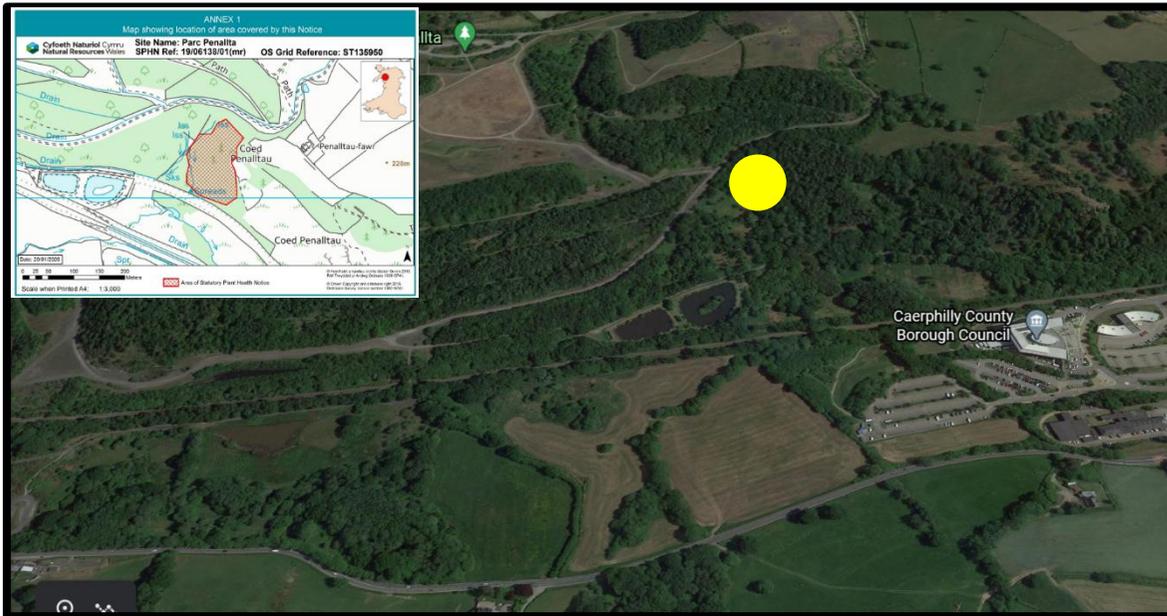
(8) <https://www.carbonbrief.org/explainer-10-ways-negative-emissions-could-slow-climate-change>

(9) <https://www.ipcc.ch/>

PROJECT BACKGROUND:

In January 2020, Natural Resources Wales (NRW) issued CCBC with a Statutory Notice (10) informing them that a stand of hybrid Larch trees in Penallta Park had been infected by *Phytophthora ramorum* (Map 1). As a result of this notice CCBC and NRW agreed to remove all larch tree from the area.

MAP 1 – Penallta Parc – Extent/Area of *Phytophthora ramorum*.



The infected area is approximately 0.89-hectares (2.2-acres) and contains 310 hybrid Larch with a total volume (estimated) of 400m³, which converts (5) to 284 Metric tonnes at 50% moisture content (fresh-felled).

A felling licence was issued by NRW in January 2020; and felling and processing was set to start in February 2021. Once the larch trees have been removed from the area CBCC rangers plan to replant it with a range of native broadleaved species and allow natural regeneration to fill gaps.

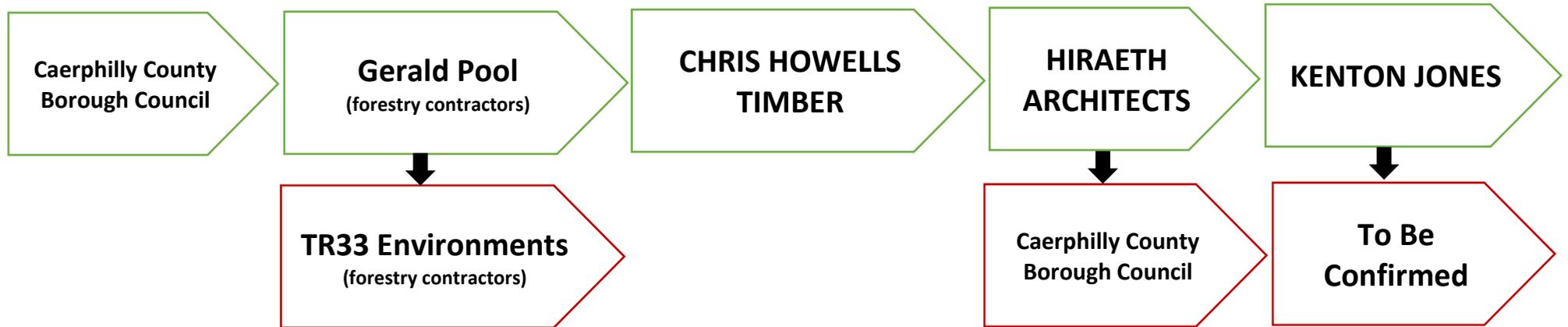
Data to be collected during this period included:

- Confirm the number of trees felled.
- Determine number and volume of sawlogs.
- Determine number and volume of small-poles (bars and tops).
- Determine volume of 'waste' left on site (branchwood).

10. <https://gov.wales/sites/default/files/publications/2019-05/phytophthora-ramorum-management-strategy.pdf>

PROJECT DETAILS: Supply Chain.

PROCESS AND PARTNERS



Work to fell and extract the trees from Penallta commenced in January 2021. Less than 2-weeks into the operation, a breakdown in communication between council officers lead to the contractor (Gerald Pool Tree Services) being told to stop work on the site to begin work on another part of the council's estate. This led to a period of disruption that ultimately caused delays and issues through the entire supply chain.

Subsequent forestry work (felling and extraction of larch) was undertaken by TR33 Environments who were able to complete the work within 2-3 weeks. Larch was felled and extracted to an area of Penallta where it was later delivered to Chris Howells's sawmill in Caerphilly.

The logs were processed in December 2021.

LANDSCAPE:



SUPPLY CHAIN:

Sawmilling - estimation of final volume delivered to Chris Howells – 44.4tonne of Larch logs and poles.

Number of logs	Average Ø	Length	Weight (tonnes – over-bark)
20	26.5 cm	1.8 metres	1.37
95	30 cm	2.4 metres	11.08
74	29.5 cm	3 metres	10.44
42	30.5 cm	3.6 metres	7.6
27	26 cm	4.8 metres	3.95
			20 (woodchip)
258	29.24	2.89	44.44

Conversion of logs to weight (diameter, length & number of pieces at over-bark) – [timberpolis](#) calculator.



PROCESS:

Chris Howells' Timber & Landscape Supplies Ltd, established in 1993, is a family run business based in Caerphilly. Sawmilling services sit alongside a wider choice of landscaping supplies - <http://www.timber-and-landscape.co.uk> The business is well-equipped with the latest sawmilling and processing equipment and staff have an extensive knowledge of the trade. Logs were felled from the designated area and extracted to a small turning site within Penallta Wood, where they were collected and taken to the sawmill for further processing.



Breakdown: (Huber Log Scale):

Number of logs	Average Ø	Length	Weight (tonnes – over-bark)	Volume (cubic metres – over-bark)
20	26.5 cm	1.8 metres	1.37	2
95	30 cm	2.4 metres	11.08	15.84
74	29.5 cm	3 metres	10.44	14.93
42	30.5 cm	3.6 metres	7.6	10.87
27	26 cm	4.8 metres	4.73	6.9
			20 (woodchip)	23.26
				2 (other use)
258	29.25	2.97	55.22	75.80

Conversion of weight to volume (m³ – cubic metres) – [Forestry Commission](#). Conversion as industrial roundwood – 1.43.

PRODUCTS & USE:

The original intention of the project was to fell and process logs that could be used to support a homeless shelter project at Argoed Baptist Church (A). Due to issues detailed previously and below, this ambition was cancelled, and all timber produced from the felled larch will be utilised to construct a visitor centre at Parc Penallta (B).

- Approximately 22m³ of 160mm x 40mm x 4m will be used to provide timber to construct a building for a homeless shelter project at Argoed Baptist Church
- Approximately 20-tonne of roundwood logs has been processed as woodchip.
- Remaining 27.29m³ of timber will be used the council Parks Department for various applications
- Chris Howells will purchase all remaining logs/wood/sawmilling-waste.

A



B



OBSERVATIONS:

The project has taken place against the background of a global pandemic (Covid 19) which prompted Welsh Government to place restrictions on business and the movement of people. At the same time, local timber businesses have seen an increase in demand for their services, due to the difficulties of importing timber/products from the European Union.

The project was basic in its ambition: **fell trees – extract logs – process logs – utilise sawn timber locally**. We have been building timber-framed houses in the UK from local woodlands/plantations since the 13th Century (churches since the 11th Century) and we are still trying to determine the most efficient ways to achieve this!

The reality is of a project that could have taken 20/30-days to complete has failed to deliver that ambition more than 40 weeks after the work commenced in January 2021. A thoughtful analysis of the project can hopefully offer more effective processes that consider the best methods to manage the Council's wooded properties in the future.

DETAIL:

Wales is not short of organisations that promote the use of 'home-grown' timber: Coed Cymru, National Resources Wales, Institute of Chartered Foresters, Woodknowledge Wales and Coed Cadog have all produced similar reports over the past 20-30years which have determined the feasibility of harvesting and processing timber at localised scales.

The entire project has been challenged to the point whereby the original ambition to fell, extract and process trees into timber has failed to meet its original objective – the design and construction of a homeless shelter. The final volume of sawn timber will now be used to provide cladding (22mm x 150mm) for the construction of a visitor centre at Parc Penallta.

Project Costings (felling, extraction, sawmilling & report) – **75.80m³ = £7,040 (£92.87m³)**

Note: 55-65% usable timber, 15-20% sawmill residue, 25-30% sawdust.

FUTURE STRATEGIES:

In 2021, Caerphilly County Borough Council published its DECARBONISATION STRATEGY: [REDUCE-PRODUCE-OFFSET-BUY](#)

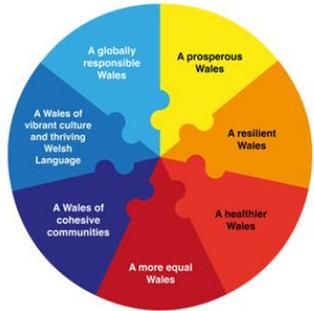
Within this document are several references to utilising existing woodland to develop effective mitigation strategies:

- 1. 5.9 Caerphilly CBC will continue to improve its carbon reduction by exploring afforestation, creation of new wetlands, development and changes in land use to maximise carbon capture through sequestration. If technological advancements allow, consideration will be given to physical Carbon Capture Storage options as well as biological storage.*
- 2. Existing Woodland: 8.22 It is imperative that the Council effectively manages its current land holdings to ensure that its woodland remains healthy. The recent onslaught of disease such as ash dieback and Phytophthora ramorum makes it even more important that no more woodland is lost. A full inventory of council owned woodland is available, and the Council works hard to maintain and improve its tree stock with the resources it has to its disposal.*
- 3. Tree planting: 8.23 It is widely acknowledged that tree planting helps to lock in carbon emissions. Longer living trees such as yew, lime and chestnut will lock carbon in for very long timeframes, a process known as sequestration.*
- 4. 8.24 Carbon Dioxide removal through afforestation will play a major role in Caerphilly CBC achieving its net zero target, and the quantity of new tree planting that the Council aspires to is anticipated to be significant. The authority will need to undertake a land review to identify suitable areas that can be planted. Welsh Government is looking to establish a new National Forest within Wales, and this provides an opportunity whereby Caerphilly CBC can look beyond its physical boundaries to join national schemes to offset our local carbon emissions.*

Note: As a director of Clo Carbon Cymru and Sida Agroforestry CIC, the author is required to register a possible conflict of interest relating to the comments and advice offered in the following section of this report. Both companies operate strict ethical principles of integrity, independence, and impartiality. Identified staff members are required to disclose any interests that may conflict with their functions as ‘technical experts’ who regularly contribute to the development of solutions to climate-breakdown in expert committees, advisory groups, conferences, study and scientific groups.

The following comments are, to the best of my ability, actually and ostensibly, objective in nature.

FRAMEWORKS:



Councils at every level in Wales are expected to frame their activities around the defined goals of the Well-being of Future Generations (Wales) Act 2015 (9), and through several 'new' economic paradigms that determine their levels of operational, social and environmental responsibility.

This report has considered the goals of the Future Generations act and set them alongside the fundamental principles of each of these economies:

ECONOMIC PARADIGMS:

THE FOUNDATIONAL ECONOMY. The foundational economy is built from the activities which provide the essential goods and services for everyday life, regardless of the social status of consumers. These include, for example, infrastructures; utilities; food processing; retailing and distribution; and health, education, and welfare.

THE CIRCULAR ECONOMY. A circular economy is an economic system aimed at eliminating waste and the continual use of resources. Circular systems employ reuse, sharing, repair, refurbishment, re-manufacturing, and recycling to create a close-loop system, minimising the use of resource inputs and the creation of waste, pollution, and carbon emissions.

THE LOW CARBON ECONOMY. A low carbon economy is a system that aims to minimize its output of greenhouse gasses while functioning as a typical economic program. This structure has become the long-term goal of countries who are trying to reduce the effects of global warming.

THE JUST TRANSITION ECONOMY. Just Transition is a framework developed by the trade union movement to encompass a range of social interventions needed to secure workers' rights and livelihoods when economies are shifting to sustainable production, primarily avoiding climate-change, and protecting biodiversity.

THE WELL-BEING ECONOMY. Defined as a 'capacity to create a virtuous circle in which citizens' well-being drives economic prosperity, stability and resilience, and vice-versa those good economic outcomes allow to sustain well-being investments over time'.

(9). <https://www.futuregenerations.wales/about-us/future-generations-act/>

Climate scientists now accept that humanity has overstepped the threshold of maximum safe cumulative emissions and that no amount of emissions reduction alone will return the climate to within safe bounds. Foremost in the effort to reduce greenhouse gas emissions will be mitigation strategies that capture excess carbon dioxide (CO₂) from the atmosphere, which will assume an importance equal to or greater than a reduction in emissions.

1. Caerphilly CBC will continue to improve its carbon reduction by exploring afforestation, creation of new wetlands, development and changes in land use to maximise carbon capture through sequestration. If technological advancements allow, consideration will be given to physical Carbon Capture Storage options as well as biological storage.

Afforestation Risks:

Increasing the amount of 'woodland' in Wales is a long-standing ambition of Welsh Government, several NGOs and the timber industry. That ambition also exists within the consciousness of the nation as being, generally, a positive action to take regarding 'well-being' and climate-breakdown.

Similarly, woodland owners and managers continue to plan and grow trees in the belief that conventional methods of forestry are adaptable to climate-breakdown, and that trees will still manage to achieve predicted yields, seemingly ignorant of the fact that levels of atmospheric CO₂ are, at 418/421ppm, as high as there were last during the Pliocene, when sea levels were 7m higher and the Antarctic was covered in beech trees!

We know from recently published [scientific reports](#) that climate-breakdown is likely to affect the process by which trees are currently growing. In recent years Wales has experienced prolonged periods of drought, followed by downpours that have caused severe flooding in many parts of the country. Given the very urgent need to remove massive volumes of CO₂ from the atmosphere by both natural and mechanised systems, researchers are now questioning the wisdom of planting trees (or billions of trees!) with an expectation that they will live for at least 100-years - during which time a single tree is expected to sequester a 1-tonne of CO₂ from the atmosphere!

A more effective and progressive approach to [Carbon Dioxide Removal](#) (CDR) would be for the council to consider the establishment of agroforestry systems, where fast-growing species of plants/trees can be grown and harvested over short cycles. Here, rapid drawdown of CO₂ can be set alongside efforts to reduce emissions through the development of new economic models and low-carbon products (building materials) that can replace carbon-heavy materials - CO₂ conversion & use (CO₂U) or Carbon Capture and Use (CCU)

Example:



Cynon Taf Community Housing Association recently published its 'decarbonisation' strategy, detailed here – www.down-to-zero.co.uk. An initial 'carbon-audit', based on Greenhouse Gas Protocols 1-3, prompted the housing association to take responsibility, in part, for the emissions of their entire tenant-base (4,000 people). That decision led to the development of a 'socially-equitable decarbonisation model'. This is widely acknowledged as being a world-first 'community-based' carbon mitigation strategy.

The housing association then went on to develop their approach to decarbonisation through a dual approach that adopted measures to reduce emissions and to drawdown CO2 (and other greenhouse gases) from the atmosphere via progressive systems of agroforestry.

This ambition will be realised through the purchase of land that will enable the housing association to adopt progressive land-use models that allow it to achieve its desired goals of emission reduction of up to 3,500T/CO2e by 2030. Opportunities will be exploited that enable the creation of up to ten social-enterprises (low-carbon focused), including a food-growing enterprise, which will collaborate with 3 local farms to deliver fresh dairy and non-meat products into the community.

This model can be replicated to suit individual communities and presents opportunities for collaboration to increase the impact of the plan.

Existing Woodland:

2. It is imperative that the Council effectively manages its current land holdings to ensure that its woodland remains healthy. The recent onslaught of disease such as ash dieback and Phytophthora ramorum makes it even more important that no more woodland is lost. A full inventory of council owned woodland is available, and the Council works hard to maintain and improve its tree stock with the resources it has to its disposal.

The CBBC 'Country Parks Survey' has determined that the woodland estate contains more than 11,000m³ of wood (predominantly coniferous) growing mainly within Parc Penallta and Parc Cwm Darran. The document carries details of various management prescriptions, seen as being effective in terms of sustaining and improving biodiversity, maintaining landscape features, and providing opportunities for the community to access 'nature'.

One approach to the management of existing woodlands (native broadleaf as opposed to conifer plantations) that is currently being considered by experts is to adopt a progressive programme of coppicing and pollarding; a widely used practice in many native woodlands in the UK until the 1950s. Here, existing trees would be felled and allowed to regrow, while providing a significant volume of biomass that can be used to 'offset' emissions. Relevant biomass conversion technologies would include the manufacture and utilisation of biochar and/or the adoption of technologies that convert biomass to soil which is then utilised to increase organic matter (soil-organic carbon) – [Thermal Aerobic Carbon Production](#)

Emissions can be further reduced through the adoption of more efficient methods of construction. Over recent years, designers in the Europe and the USA have established the concept of '[cordwood construction](#)' as an effective low-carbon alternative to building homesteads. Growing plants and trees over short harvesting cycles, which can be utilised to manufacture low-carbon building materials, preferably in cross-sector collaborations with housing associations have been described previously in this document.

Given the very real and urgent need to reduce emissions and sequester massive volumes of carbon dioxide from the atmosphere, the need to set new strategies in place that manage council-owned natural resources more effectively are pressing.

COMMENTS & RECOMMENDATIONS:

1. The project set out to *'reduce inherent risks associated with product and supply-chain development and to improve issues associated with sustainability, particularly in relation to greenhouse gas emissions, which could lead to the creation of jobs in local communities.'*
2. The requirement to fell 310 larch trees (according to NRW felling licence issued in January 2020) can be viewed as a failure of the project. Of the total volume of 400m³, the project managed to fell about 75m³ (44-tonnes from an estimated 284 tonnes – 15-16%). A simple extrapolation here would indicate that felling the entire requirement could have cost more than £20,000.
3. It is difficult to claim any kind of successful outcome to this project, other than the obvious need to review how forest/woodland operations are carried out in the future. Credit must be given to the Project Manager (Dylan Jones) who maintained a high-level of professionalism throughout the course of the project, despite the problems that occurred at the felling and sawmilling stage of the work.

To some extent, the project discovered the problems associated with developing localised supply chains – in this case it has completely failed to deliver the required outcome! To avoid these problems occurring again in future, the recommendation would be to enable the existing team of Countryside Rangers to take on the responsibility of managing the council's wooded resource and to develop suitable strategies that consider climate-breakdown and the council's decarbonisation ambitions.

Within the scope of responsibilities for the new team would be to develop a more collaborative approach to resource management that considers the very urgent need to facilitate the creation of cross-sector partnerships that support emission reduction strategies within broader ambitions.

- The Council should consider investing in the plant and machinery that would enable them to manage their wooded estate more efficiently and more effectively in terms of carbon management. Mobile sawmilling is a mature approach to managing small woods - <https://woodlandmills.co.uk/portable-sawmills/> - and the return on investment would be achieved within 12 months of purchase.

There will be a demand within the council to procure timber and wood-products and given the volume of trees, described previously, that need to be felled in accordance with Welsh Government legislation (larch and ash), then the decision to invest in a small, mobile sawmill should be given serious consideration.

- At the same time, the production of sawn-timber could be used to support the creation of a localised wood-product industry, where artisan designers, builders and crafts-people could begin to manufacture products that replace imported goods. An example of this can be seen at <http://www.wentwoodtimbercentre.co.uk/>, and www.themilledwoodcompany.com

Given the large volume of diseased larch and ash that needs to be felled in coming years, an investment in resource management that enables decarbonisation goals to be achieved would be encouraged.

ANNEX: LOW-CARBON BUILDING:

Building Impact Zero Network
LEARN BIØN

A Handbook Guide for Hands-On Learning
from the Building Impact Zero Network

2018, 2nd Edition





Learn Building Impact Ø

**#1 Design and Build
with Compressed Earth Blocks**

20th April- 21st May 2017
Montemor-o-Novo, Portugal

By Oficinas do Convento NCO

2018 | 1st edition





Learn Building Impact Ø

**#3 Design and Build
with Cordwood**

31st July-27th August, 2017
Östertälje, Sweden

By Architectural Environmental Strategies

2018 | 2nd Edition





**#6 Design and Build
with Local and
Recycled Materials**

04th June-29th June, 2018
Milan, Italy

By ARCo Architecture and Cooperation

2018 | 1st Edition



Cordwood Construction.






WOOD
Used for the frame and the wall filling in this project we use a mixture of different types of wood.

-  **PINE** (soft)
Used for the frame, and for walls made with recycled timber
-  **OAK** (hard)
Used for the floor and parts of the wall
-  **BIRCH** (hard)
Used for the walls





STRAW (soft) **SAND** (hard)

CLAY (hard)

MORTAR MIX